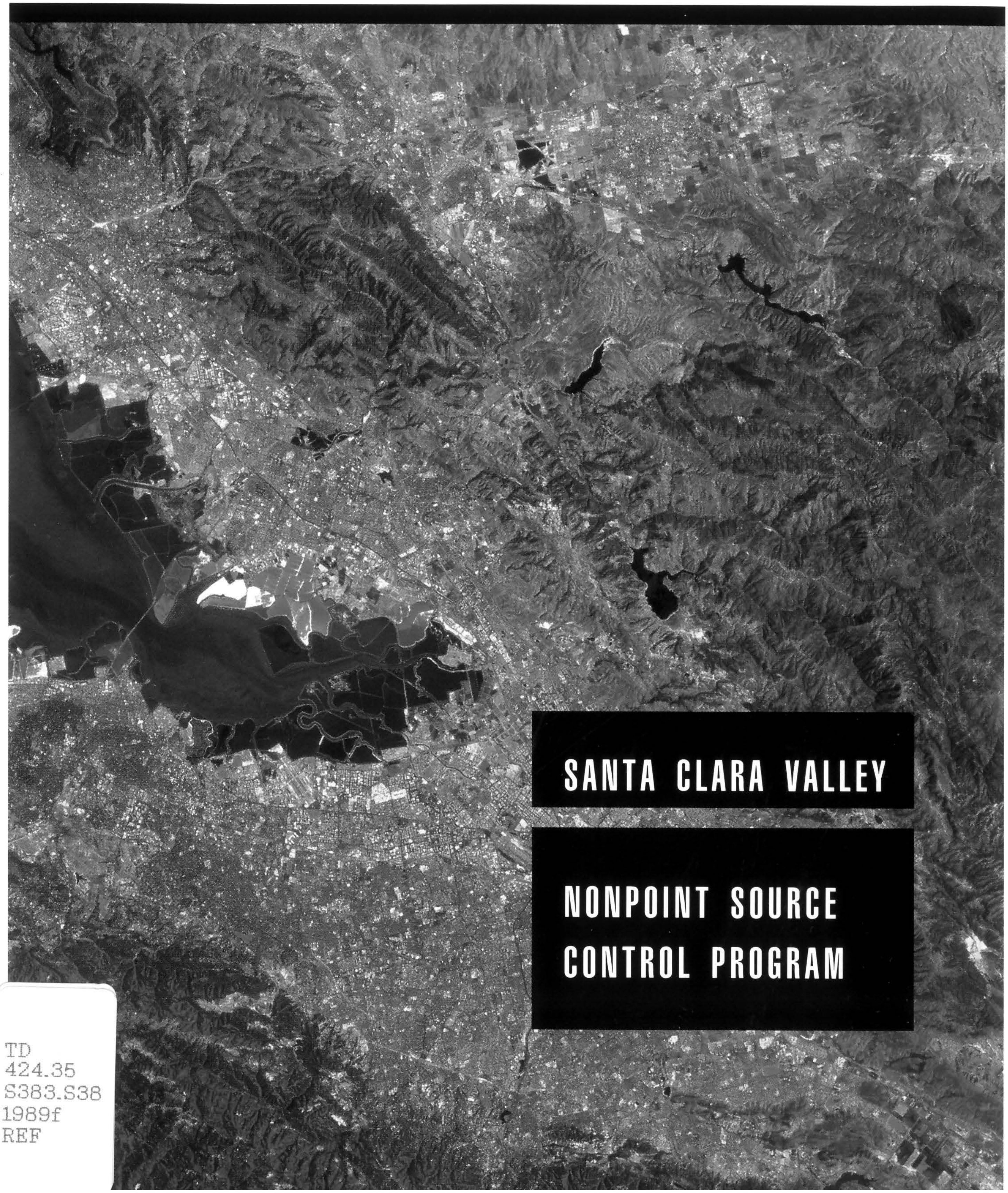
NPS Control Program

VOLUME II/ DECEMBER 1989



SANTA CLARA VALLEY

NONPOINT SOURCE CONTROL PROGRAM

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Final Report

Santa Clara Valley Nonpoint Source Study

Volume II: NPS Control Program

Submitted to

Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, CA 95118

December 14, 1989

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8720115A/5400

TABLE OF CONTENTS

Section		Page
PREFACE		vi
1.0	INTRODUCTION	1-1
	1.1 Overview of Water Quality Conditions	1-1
	1.2 Historical Overview of Water Quality Control Programs	1-3
	1.3 Present Approach for Controlling Nonpoint Source Pollution Problems	1-5
	1.4 Nonpoint Source Regulatory Requirements That Apply to Lower South Bay Communities	1-6
2.0	SANTA CLARA VALLEY NPS CONTROL STRATEGY	2-1
	2.1 Background	2-1
	2.2 Resultant Strategy	2-3
	2.3 NPS Control Programs	2-9
3.0	DEVELOPING THE AREAWIDE NPS CONTROL PROGRAM	3-1
	3.1 Background	3-1
	3.2 Description of Planning Process	3-4
	3.2.1 Task 1 - Define Program Objectives	3-4
	3.2.2 Task 2 - Develop Evaluation and Planning Criteria	3-7
	3.2.3 Task 3 - Compile Inventory of Candidate Control Measures	3-7
	3.2.4 Task 4 - Apply Criteria to Screen Candidates	3-8
	3.2.5 Task 5 - Apply Professional Judgement to Select a Practical Set of Controls	3-9
	3.2.6 Task 6 - Estimate Overall Program Costs and Effectiveness	3-11
	3.2.7 Task 7 - Revise the Previously Defined Control Programs to Balance Cost, Effectiveness, and Other Factors	3-12
	3.2.8 Task 8 - Describe the Respective Roles of the Jurisdictions and Agencies That Will Implement the NPS Control Program	3-13

TABLE OF CONTENTS (concluded)

Section Page

3.2.9 Task 9 - Develop the Schedule for Implementing the Areawide NPS Control Program and for Developing Local Programs 3-13
3.3 Results of the Planning Process 3-14
3.3.1 Evaluation and Planning Criteria 3-14
3.3.2 Inventory of Candidate Control Measures 3-18
3.3.3 Application of Criteria to Screen Candidates 3-18
3.3.4 Use of Professional Judgement to Select Practical Sets of Controls 3-19
3.3.5 Estimates of Program Cost and Effectiveness 3-32
3.3.6 Revision of Control Programs to Balance Cost, Effectiveness, and Other Factors 3-39
3.3.7 Roles of the Jurisdictions and Agencies That Will Implement the NPS Control Program 3-39
3.3.8 Schedule for Implementing the Areawide NPS Control Program and for Developing Local Programs 3-40

4.0 RECOMMENDED MONITORING PROGRAM 4-1

4.1 Introduction 4-1
4.2 Characterization Monitoring Program 4-1
4.2.1 Introduction 4-1
4.2.2 Sampling Program 4-2
4.3 Control Measure Effectiveness Evaluation Program 4-4
4.4 Additional Studies 4-6
4.4.1 Stream Sediment Studies 4-6
4.4.2 Pollutants Associated with Settleable Solids Fraction 4-7

APPENDIX A CANDIDATE CONTROL MEASURES A-1
APPENDIX B CONTROL MEASURES WHICH WERE NOT SELECTED B-1
APPENDIX C PROGRAM I CONTROL MEASURES C-1
APPENDIX D PROGRAM III CONTROL MEASURES D-1

LIST OF TABLES

Table		Page
3-1	EXISTING NPS CONTROL MEASURES	3-3
3-2	PROCESS FOR DEVELOPING THE RECOMMENDED AREAWIDE NPS CONTROL PROGRAM	3-5
3-3	PROGRAM II - RECOMMENDED AREAWIDE NPS CONTROL PROGRAM	3-26
3-4	COMPARISON OF ESTIMATED BUDGETS FOR THE THREE ALTERNATIVE AREAWIDE NPS CONTROL PROGRAMS	3-34
3-5	ROLES AND RESPONSIBILITIES FOR AGENCIES THAT WILL IMPLEMENT THE RECOMMENDED AREAWIDE NPS CONTROL PROGRAM	3-41
4-1	PROPOSED SUITE OF CHEMICAL ANALYSIS OF WATER QUALITY SAMPLES	4-3

LIST OF FIGURES

Figure		Page
2-1	FLOWCHART OF SANTA CLARA VALLEY STORMWATER MANAGEMENT PROGRAM	2-5
3-1	NETWORK DIAGRAM ILLUSTRATING PROCESS OF DEVELOPING AREAWIDE NPS CONTROL PROGRAM	3-20
3-2	COMPARISON OF CONTROL MEASURES INCLUDED IN EACH OF THE THREE ALTERNATIVE AREAWIDE NPS CONTROL PROGRAMS	3-30
3-3	COMPARISON OF ALTERNATIVE AREAWIDE NPS CONTROL PROGRAMS ON THE BASIS OF THEIR ESTIMATED COSTS AND EFFECTIVENESS	3-36

PREFACE

The Santa Clara Valley Non-point Source Study was initiated by and has been guided and supported by a group consisting of 13 cities, the County of Santa Clara, and the Santa Clara Valley Water District--all of which contribute storm runoff to the Lower South Bay (i.e., that portion of San Francisco Bay which is located south of the Dumbarton Bridge). The study was conducted in response to a regulatory requirement in the San Francisco Regional Water Quality Control Board's 1986 Basin Plan.

The participants in this group include the following cities:

- Campbell
- Cupertino
- Los Altos
- Los Altos Hills
- Los Gatos
- Milpitas
- Monte Sereno
- Mountain View
- Palo Alto
- San Jose
- Santa Clara
- Saratoga
- Sunnyvale
- Santa Clara County
- Santa Clara Valley Water District (SCVWD)

The cities and county own and operate local storm drainage facilities which discharge under permit to storm drainage channels, creeks, and rivers owned and maintained by the District. The agencies are referred to herein as the Santa Clara Valley non-point source dischargers; however, the District's responsibility as a discharger under the NPDES permit program is under review.

Representatives of these participating agencies have met regularly (approximately monthly) since late 1986 to develop and implement a program which responds to the 1986 Basin Plan requirements--and which provides a sound technical basis for developing effective plans for reducing water quality problems attributed to non-point source runoff.

Volume I: Loads Assessment Report of this project report described the objectives, study methods, and findings of the field program, the laboratory analyses, and the computer modeling which were used to estimate the dry-weather and wet-weather flows and pollutant loading rates required by the 1986 Basin Plan.

Volume II: Control Measure Report (this document) describes and discusses the applicability of control measures that have been examined and/or implemented in other communities to reduce non-point source pollution problems. Volume II is an informational document that the program participants will use to help plan their collective and individual responses to the need for controlling non-point source water pollution.

Volume III: NPS Control Program responds to the 1986 Basin Plan's requirement for a plan for implementing control programs. It consists of a discussion of the results of Volumes I and II and provides a description of the participants' proposed NPS control programs (both areawide controls and community-specific controls) and their strategy of using the existing NPDES permitting process as an effective framework within which planning and implementation of controls will be carried out.

1.0
INTRODUCTION

The purpose of this section is to provide the reader with a general understanding of the water quality conditions and regulatory programs which led to the Santa Clara Valley Nonpoint Source Study (of which this volume is a part) and the areawide nonpoint source (NPS) control program which is described herein.

1.1 OVERVIEW OF WATER QUALITY CONDITIONS

Numerous field studies have shown that there are a variety of water quality problems in various parts of the San Francisco Bay Estuary system, including the Lower South Bay. In the Lower South Bay (i.e., the area lying south of the Dumbarton Bridge, which has been the focus of the study described in Volume I of this report), elevated concentrations of several classes of water pollutants cause a variety of adverse effects on beneficial uses. The extent and importance of these adverse conditions is described in the 1986 Basin Plan, prepared by the San Francisco Bay Regional Water Quality Control Board (RWQCB), and in several other documents which have been prepared by other researchers and by environmental interest groups. The water quality issues that have triggered the most public concern are those related to toxic pollutants and their acute and/or chronic effects on aquatic ecosystems. Some of the pollutants are also potentially harmful to humans, but because the Lower South Bay and the lower reaches of its tributary streams are saline and not used for domestic water supply or irrigation, most public attention has been focused on potential impacts to aquatic ecosystems.

The substances of particular concern in this area include heavy metals, pesticides and herbicides, and oil and grease. Coliform bacteria and sediments are also often cited as being related to water quality and ecosystem issues in the Lower South Bay and its tributary streams. Concerns over acute toxicity problems derive from the fact that some of the pollutants which are discharged routinely from point sources (e.g., wastewater treatment facilities) and from nonpoint sources are known to be capable of harming aquatic organisms (e.g., plants, invertebrates, fish, marine mammals, birds), when the pollutants are present in relatively high concentrations. Concerns are also often expressed regarding chronic toxicity problems, which can go unnoticed at the time of initial direct exposure and then cause significant problems at a later time, due to latent effects, cumulative effects, and/or bioaccumulation of the pollutants within the food web.

Part of the motivation for conducting the Santa Clara Valley NPS Study was to provide some information which will further the technical understanding of water quality conditions and aquatic ecosystem impacts. However, as described in Volume I, most of the study's attention was focused on determining nonpoint source concentrations and loads during wet-weather and dry-weather conditions. As noted, a broad spectrum of pollutant substances was sampled and analyzed, but the attention was focused on the following major classes of pollutants, because they are of greatest concern to those who are interested in ecosystem effects. Tests were conducted for the following:

- heavy metals
- pesticides and herbicides
- hydrocarbons
- coliform bacteria
- sediment characteristics
- toxicity

1.2 HISTORICAL OVERVIEW OF WATER QUALITY CONTROL PROGRAMS

The processes that have been used to define and implement water quality control programs have evolved considerably over the past 20+ years. Their history can be described as having taken two parallel tracks, simultaneously:

- Regulatory agencies have required implementation of controls which reduce the amounts of pollutants discharged from the most significant sources.
- Regulatory agencies have required studies to provide information which will increase the technical understanding of pollutants, transport and dispersion mechanisms, and impacts on beneficial uses.

Significant progress has been achieved on each of these two tracks, as a result of concerted work by the RWQCB, State Water Resources Control Board (SWRCB), and U.S. Environmental Protection Agency (EPA); other public agencies; and the efforts and expenditures of many regulated waste dischargers (both public and private).

The approach to implementing controls has changed over time, as summarized below:

- Technology-based Control Requirements. The original approach to water quality control required prescribed types and/or degrees of treatment to be applied to all major point sources. Publicly owned treatment works and industrial waste treatment facilities were required to employ prescribed types and/or degrees of pollutant removal, without much regard to the site-specific factors which determine how effective the facilities would be at protecting or enhancing actual beneficial uses. This approach was viewed, at the time, as representing an effective (if not always equitable) first step toward reducing the amounts of pollutants discharged to receiving waters.

- Water Quality Objectives and Waste Load Allocations. As the need for additional pollution control became apparent and as important technical information on receiving-water conditions and processes became more available, a more rational approach to water quality planning emerged. The approach, which is now often used to plan for point source pollution controls, generally begins with a formal consideration of the desired end result (i.e., the protection and enhancement of certain beneficial uses in a particular area) and then involves rationally determining the degree to which pollutant loading rates need to be controlled to achieve the desired result. For this process to be effective, it is necessary to have a good understanding of several important cause-and-effect relationships which tend to be relatively site-specific (e.g., the threshold concentrations of pollutants which will avoid ecosystem impacts, the relationship between pollutant loading rates and the threshold concentrations, and the effectiveness of controls which should be applied to various sources). This approach to water quality control is most effective in cases where the ecosystems are relatively simple and well-understood, where the physical/chemical/biological processes in the receiving waters are relatively simple and well-understood, and where there are a few well-defined sources and a few well-understood pollutants of concern. The process is intellectually satisfying, but it has not proven to be very satisfactory when applied to situations which are inherently very complex and/or data-limited. Recognizing this, the RWQCB has called for numerous major studies which will provide an improved understanding of conditions and processes in the Lower South Bay (which are both complex and data-limited). This Santa Clara Valley NPS Study is one of those studies.

1.3 PRESENT APPROACH FOR CONTROLLING NONPOINT SOURCE POLLUTION PROBLEMS

Experience has shown that the effective control of nonpoint source pollutants will require a specialized approach which employs certain features of each of the preceding approaches. A special approach is needed for NPS water quality control, for several reasons:

- Many different pollutant substances are involved.
- There are many different pollutant sources and they would be difficult to locate and quantify.
- The timing of the discharge events is extremely variable and unpredictable.
- The physical/chemical/biological conditions and processes in the receiving water are extremely variable and are not yet understood in quantitative terms.
- The effects of pollutants on beneficial uses are not yet well understood in quantitative terms.

Accordingly, federal, state, and regional regulatory agencies are inclined to focus their efforts on requiring programs that will identify and control sources and reduce loads, even if it is not possible to fully evaluate the costs and practical benefits of doing so. Accordingly, the emerging regulations and policies for NPS water quality control require communities to implement a variety of control measures that are believed to be practical and cost-effective, without first making a formal quantitative determination of their overall effectiveness in protecting and/or enhancing the designated beneficial uses. Critics of this approach state that the new NPS policies and regulations may not always be equitable or cost-effective. The approach is defended on the basis of being an effective first step toward reducing NPS loads, and being flexible enough to refine when more information on receiving water becomes available (regarding the relationships between NPS loads, receiving water pollutant concentrations, and beneficial uses).

1.4 NONPOINT SOURCE REGULATORY REQUIREMENTS THAT APPLY TO LOWER SOUTH BAY COMMUNITIES

Nonpoint source pollutants have been identified as being an important factor in many water quality problems. This has been shown in numerous focused studies nationwide, although the severity and scale of such problems have been found to vary widely, depending upon a broad spectrum of local factors. In its 1986 Basin Plan, the RWQCB concluded that point sources and nonpoint sources are both important contributors to certain water quality problems in the Lower South Bay.

Accordingly, the 1986 Basin Plan required that studies be performed to assess NPS loads and possible controls. The Santa Clara Valley NPS Study was conducted in response to these RWQCB requirements. Other subsequent regulations--notably the SWRCB's Draft Pollutant Policy Document (1988) and the EPA's Proposed NPDES Stormwater Rules (1988)--have called for the implementation of practical NPS control measures and the conduct of focused studies (to provide information necessary to continue and refine the regulatory process). Moreover, the RWQCB's forthcoming 1990 Basin Plan is anticipated to call for similar actions (i.e., control measures and additional technical studies).

Volume I of this report described the studies that were conducted to estimate the NPS pollutant loads that are discharged from Santa Clara Valley into the Lower South Bay and its tributary streams. Volume II of this report describes the areawide control program that is recommended for reducing NPS loads. Volume II also describes the process used to evaluate a large number of candidate control measures and to select those that appear to be most worthy of implementation in the near future. Volume III of this report will describe the NPS problem evaluation and decision-making process in some detail, because during the next year, the 13 participating cities, the County of Santa Clara, and the SCVWD will all need to use variations of the process to develop their own carefully tailored local implementation plans (which will prescribe the specific controls they will use in their respective jurisdictions).

2.0
SANTA CLARA VALLEY NPS CONTROL STRATEGY

2.1 BACKGROUND

As described in Volume I of this report, the 13 cities, the County of Santa Clara, and the SCVWD joined together in 1987 to respond to NPS requirements that were set forth in the RWQCB's 1986 Basin Plan. Their response consisted of forming an ad hoc NPS Task Force to guide their collective efforts, working with consultants to develop an Action Plan, working with Woodward-Clyde Consultants to conduct the required NPS studies, and developing a strategy for selecting and eventually implementing effective control measures. Some of these controls will be implemented on an areawide basis, others will be implemented in specific locations to deal with specific sources and/or problems.

The above participants have met regularly (since early 1987) in several different forums to develop the best strategy for dealing with nonpoint source water quality matters and the associated regulatory requirements. As a result of meetings held this summer (i.e., 1989), the participants made the following decisions regarding areawide and local NPS programs:

- Cooperative Approach. All Santa Clara Valley nonpoint source dischargers have decided to continue to work together and will function as a unified entity which can effectively address and deal with the present and emerging federal, state, and regional water-quality agencies and their NPS regulations and policies.

The SCVWD has agreed to continue in its role of providing leadership for this entity. The 13 cities, the County, and the SCVWD will all participate by providing support in the form of personnel time, in-kind services, and actual funding to support the necessary out-of-pocket costs. For the areawide NPS control program, the participants plan to contribute such support according to a funding allocation formula which is similar to the one used during the 1988-1989 Santa Clara Valley NPS Study. The NPS Task Force, which is made up of interested representatives from the cities, the County, and the SCVWD, will continue to serve as an ad hoc steering committee for this effort.

- Budgeting. Each participant (i.e., the cities, the County, and the SCVWD) will (or already has) introduce a nonpoint source item in its present budget and in its long-term planning/budgeting process. In some cases, participants will have to amend next year's budgets to provide for their share of the estimated aggregate cost, calculating shares on the basis of the existing allocation formula for actual funding. The participants understand the need to provide similar funds and similar contributions of personnel time for future years, despite the fact that specific requirements cannot be delineated at this time.

- Permit Process. The participants will act as co-applicants to obtain an NPDES permit under present federal and state regulations. A draft of the application and draft text for the permit are being developed now by the SCVWD and will be reviewed by the co-applicants during the next few months, finalized by January 1990, and submitted to the RWQCB before the new federal stormwater regulations become effective (estimated to be mid-June of 1990). The language of the application and permit will assert that the work performed to date (i.e., this Santa Clara Valley NPS Study and other related NPS Task Force efforts) constitute a functional equivalent of the work required by the EPA's proposed stormwater regulations. The text of the permit will describe a set of monitoring activities and areawide control measures which will be implemented immediately, and a phased program which will be used to evaluate, plan, and implement additional areawide and local control measures during the 5-year term of the NPDES permit.

2.2 RESULTANT STRATEGY

The result of the planning efforts by the NPS Task Force and the participating cities, county, and SCVWD is a control strategy which has elements which will be implemented at the areawide level and at the local level by the various participants.

The work required over the next several years will consist of the following:

- Permit Development - This will consist of a series of tasks which will result in an NPDES permit application (i.e., a transmittal letter and a draft of the suggested permit text).

- Liaison - This will consist of efforts by the NPS Task Force and its consultants to coordinate with the regulatory agencies (i.e., EPA and RWQCB), leading to the issuance of the NPDES permit for stormwater discharges.

- Compliance - This will consist of a series of planning tasks and technical studies which will be conducted to carry out the various conditions stipulated in the NPDES permit. These will be carried out over the 5-year term of the permit, in accordance with an agreed-upon implementation schedule.

The work that will be performed in each of the above-cited areas is described below and illustrated on Figure 2-1, in the form of several discrete elements:

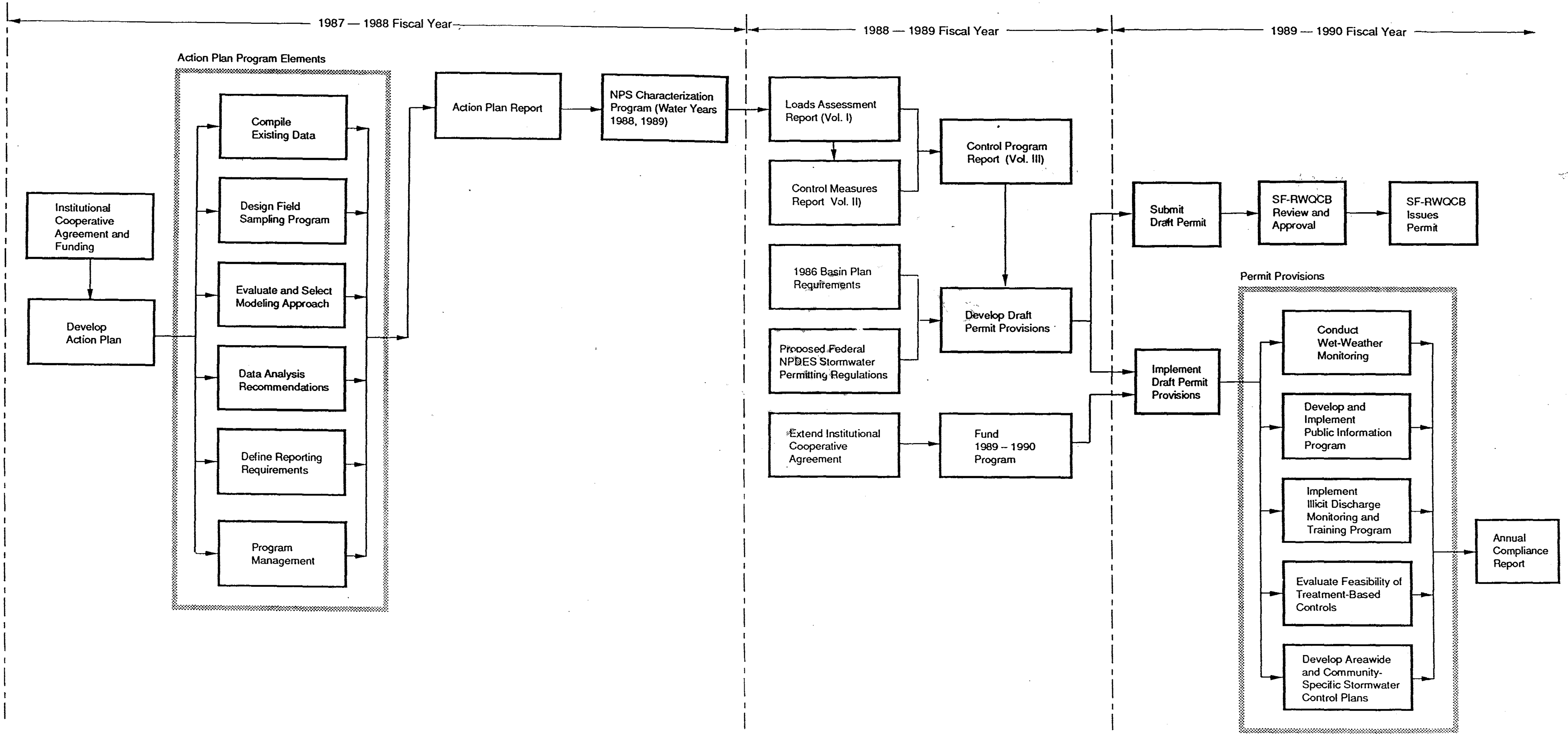
A - Permit Development

Element A-1 - The SCVWD, Woodward-Clyde, and members of the NPS Task Force will continue the process of developing text which will be used in the NPDES permit application and in the permit itself (i.e., the participants will provide the regulatory agencies with language which describes relevant conditions and suggests a practical control program and an implementation program).

Element A-2 - The NPS Task Force, Woodward-Clyde, and a legal consultant will consider the legal/institutional/administrative aspects of the participants joining together to be co-applicants for the NPDES permit (including possible alternative legal arrangements among the participants).

B - Liaison

Element B-1 - Representatives of the SCVWD, the NPS Task Force, and Woodward-Clyde will meet with appropriate regulatory agency representatives to be sure that the content, degree of detail, format, and tone of the NPDES permit application and the suggested permit text (and implementation schedule) will meet the regulatory agencies' respective needs and expectations. This will involve liaison with representatives from the RWQCB, the SWRCB, EPA Region 9, and possibly EPA Headquarters.


1987 — 1988 Fiscal Year
1988 — 1989 Fiscal Year
1989 — 1990 Fiscal Year
Institutional Cooperative Agreement and Funding
Develop Action Plan
Action Plan Program Elements
Compile Existing Data
Design Field Sampling Program
Evaluate and Select Modeling Approach
Data Analysis Recommendations
Define Reporting Requirements
Program Management
Action Plan Report
NPS Characterization Program (Water Years 1988, 1989)
Loads Assessment Report (Vol. I)
Control Measures Report Vol. II)
Control Program Report (Vol. III)
1986 Basin Plan Requirements
Proposed Federal NPDES Stormwater Permitting Regulations
Develop Draft Permit Provisions
Extend Institutional Cooperative Agreement
Fund 1989 – 1990 Program
Submit Draft Permit
SF-RWQCB Review and Approval
SF-RWQCB Issues Permit
Implement Draft Permit Provisions
Permit Provisions
Conduct Wet-Weather Monitoring
Develop and Implement Public Information Program
Implement Illicit Discharge Monitoring and Training Program
Evaluate Feasibility of Treatment-Based Controls
Develop Areawide and Community-Specific Stormwater Control Plans
Annual Compliance Report

NOTE:
It is recognized that the participating cities and the County will have to obtain approvals and authorizations from their respective decision makers, as a part of the program shown here.

Figure 2-1
FLOWCHART OF SANTA CLARA VALLEY STORMWATER MANAGEMENT PROGRAM

Element B-2 - NPS Task Force members and other representatives from the participating cities, the County, SCVWD, and Woodward-Clyde will meet with RWQCB staff representatives to coordinate plans for several of the programs that will be stipulated in the NPDES permit. These required programs will include, for example, the continuing stream monitoring, development of strategies and procedures for identifying illicit discharges and illegal connections, implementation of specific aspects of the areawide NPS control program, development of model ordinance text for use in Santa Clara Valley communities, and development of community-specific NPS control programs to address localized problems.

Element B-3 - The SCVWD and other NPS Task Force members will develop and implement an effective strategy for coordinating the overall NPS control program and NPDES permitting process with interested members of the public. This public participation process will be designed to meet applicable requirements but also to be pro-active to include constructive input from individuals and interested environmental groups alike.

C - Compliance

Element C-1 - The cities, the County, and the SCVWD will work together to complete and refine the planning process begun in this report. They will review, evaluate, and modify (as necessary) the various control measures that comprise the presently recommended areawide NPS control program. They will also review and modify the description of participants' respective roles and responsibilities and the draft schedule for program implementation. The end product of this task will be the formal adoption of the resultant areawide NPS control program by all of the participants.

Element C-2 - Woodward-Clyde will work with the NPS Task Force (and others as necessary) to develop effective strategies for implementing the areawide "educational" control measures (described in Section 4.0). These will include measures to inform various carefully targeted audiences (e.g., the public at large, commercial/industrial interests, land developers and contractors, consulting engineers/planners/architects, city and county agency personnel) about things they should do and should not do to help reduce NPS pollution problems. Some of the specific "educational" methods that will be considered here will include fliers/brochures/pamphlets, newsletters, newspaper articles, slide/video presentations, seminars/workshops, class curricula, radio/TV spots and interviews, speaker bureaus, hotlines, "bulletin boards," signs/billboards, guided field trips, and a variety of other methods and media. These educational efforts will be directed toward the target audiences in ways that make the best use of public resources and the public's interest. Particular attention will be directed toward coordinating the educational control measures with the interested environmental groups, conservation groups, volunteer organizations, and youth organizations that are active in Santa Clara Valley and elsewhere in the Bay Area.

Element C-3 - Woodward-Clyde will work with the NPS Task Force (and others as necessary) to develop effective strategies for implementing the areawide "regulatory" control measures (described in Section 4.0). This task will begin with a review of the present status and the perceived effectiveness of existing regulations and public policies which are intended to accomplish some of the objectives of Program II. The results of this task will be a generic set of regulations which can be used as models by individual agencies to develop community-specific ordinances or other forms of regulations or public policy regarding NPS control measures.

Element C-4 - Woodward-Clyde will work with the NPS Task Force (and others as necessary) to develop practical strategies and procedures to help guide field inspectors in their efforts to search for, locate, identify, and characterize illicit discharges of pollutants to storm drainage systems. The results of this task will be a simple guidance manual and an orientation workshop for maintenance and other involved personnel from the participating cities, the County, and the SCVWD.

Element C-5 - Woodward-Clyde will work with the NPS Task Force (and others as necessary) to develop effective strategies for implementing the areawide "public agency" actions (described in Section 4.0 of this study).

Element C-6 - Woodward-Clyde will work with the NPS Task Force, the participating cities, the County, and the

SCVWD to define practical local implementation plans. This task will include meetings among the most knowledgeable city, County, and district personnel to define present programs, to evaluate their coverage and effectiveness as NPS controls, and to select among the various Program II controls (and others, as applicable) that could be implemented at the local level. These local programs will be designed to supplement and/or compliment the areawide NPS control program.

Element C-7 - The participating cities, the County, and the SCVWD will conduct a series of field and laboratory studies which are intended to provide information which will be required by the RWQCB and/or will be included in the programs stipulated by the NPDES permit. A recommended monitoring program is described in Section 4.0 of this report.

Element C-8 - The NPS Task Force will develop a reporting system which will periodically gather information on all of the NPS control measures and provide the RWQCB and the EPA with a status report. This will require the development and implementation of an effective scheme for gathering information which reflects the status of each of the control measures.

2.3 NPS CONTROL PROGRAMS

Section 2.2 provides a brief overview of the process the NPS Task Force will use to develop an effective overall NPS control strategy. This overall strategy (which consists of permit development, liaison, and compliance elements) will include the implementation of areawide controls and local controls. The areawide NPS control program will consist of a series of well-defined actions that will be performed (in various ways) throughout the designated area (i.e., within those portions of Santa Clara Valley that drain toward the Lower South Bay). The local NPS control programs will consist of specific actions that will be performed within specific sub-areas (e.g., a city or portions of more than one city) to implement aspects of the areawide program and/or to supplement the areawide program.

Section 3.0 of this report describes the process used to plan the areawide NPS control program. Section 4.0 explains the results of the process and describes the recommended areawide program.

3.0
DEVELOPING THE AREAWIDE NPS CONTROL PROGRAM

3.1 BACKGROUND

The process of developing the areawide NPS control program (i.e., the program which will be applied to the overall study area) involved evaluating a large number of specific control measures, selecting those which were judged to be most appropriate to conditions in the Santa Clara Valley (on the whole), and formulating a practical implementation plan. This process was performed via nine tasks, which are described below. The process employed professional judgement and a certain degree of subjectivity, but the consultant team members followed the prescribed evaluation and selection process rigorously and documented the steps so others could review the work, evaluate the results, and follow a similar process in the future.

The process of developing the areawide NPS control program is described here in some detail, because it is anticipated that planners, engineers, and interested members of the public will need to use a similar process as they develop implementation plans for their local jurisdictions. As noted in Section 2.2, the conditions of the forthcoming NPDES permit will require the 13 individual cities, the County of Santa Clara, and the SCVWD to develop, formally adopt, and implement NPS control programs which are carefully tailored to meet local conditions in their respective jurisdictions. This development and implementation of local NPS control programs will be conducted during the 5-year term of the NPDES permit.

Before beginning the process of developing plans for new controls, the project team reviewed the status of the NPS control measures which are presently used in the study area to manage/address NPS pollutants.

In 1987, the South Bay NPS Task Force prepared (and submitted to the RWQCB) an Action Plan, which was accepted by the RWQCB as partially fulfilling the requirements of the 1986 Basin Plan. The Action Plan included information on control measures which were in use at the time. The various NPS control measures that are currently in use are summarized in Table 3-1, along with comments on the level of effort or status of each control measure. A recent survey of the jurisdictions indicated that street sweeping, litter pickup and control, and hazardous material pickup are the control measures which are the most widely employed. Additionally, storm drainage inlet/catch basin maintenance, storm sewer cleaning, public education, recycling, and local ordinances were also reported to be widely employed. In general, all of the control measures identified in Table 3-1 were reported to be used to some extent, but it is difficult to assess their relative effectiveness in reducing pollutant concentrations in stormwater runoff.

The process used to update the 1987 inventory of existing NPS controls can be summarized as follows. First, the 1986 Basin Plan and the 1987 Action Plan were reviewed for information concerning the existing NPS control measures. Personnel from each municipality in the Santa Clara Valley study area were then interviewed using a telephone questionnaire to determine if the control measures cited in the 1987 Action Plan were still in use, and if any new control measures or program had been implemented in the interim. Results from the survey were compiled into Table 3-1.

TABLE 3-1. Existing NPS Control Measures

CONTROL MEASURES	Campbell	Cupertino	Los Altos	Los Altos Hills	Los Gatos	Milpitas	Monte Sereno	Mountain View	Palo Alto	San Jose	Santa Clara	Saratoga	Sunnyvale	Santa Clara County
Street Sweeping	▨	▨	▨	▨	▨	▨	▨	▨		▨	▨	▨	▨	▨
Litter Pick-up and Control	▨	▨			▨	▨	▨			▨	▨	▨		▨
Storm Drainage Inlets/ Catch Basins Maintaince	2	2	2	2	1	2	2	1	2	1	2	1	2	
Storm Drainage Line Cleaning	2	1	1	1	1	1	2	1	1	1	2	1	2	
Stormwater Retention Basins						▨		▨			▨	▨		
Public Education re:NPS Problems	3	3,5	3,6	3	3			3	3,4,6	3,4,7	3	7	3	3
Recycling	7,8	8	8	7	7,8	▨	7,8	8	8	8	8	7,8	8	7
Hazardous Material Disposal .	10	11	11	11	7,11	10	7,11	11	10	10	10	7,11	10	7
Local Ordinances	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨	▨
Special Agency-Wide Refuse/ Vegetation Removal		▨	▨		▨	▨	▨		▨		▨			
New Development Stormwater Detention				▨		▨								

1. maintained on an as need basis only.
2. maintained at least annually before wet weather season.
3. newspaper/flyer/utility insert
4. schools and/or community groups
5. T.V. and/or radio
6. newspaper/press releases
7. program is in planning stage.
8. program (or proposed program) provides for the collection of waste oil.
9. Program (or proposed program) provides for the collection of anti-freeze.
10. at least annual household hazardous material disposal day.
11. program in conjunction with other municipalities; frequency increased to several events per year.

LEGEND

▨ Control Measure Exists
☐ Control Measure Does Not Exist

3.2 DESCRIPTION OF PLANNING PROCESS

The nine tasks which comprise the process used for developing the areawide NPS control program are summarized in Table 3-2. The nine tasks are described below; the results of the process are described in Section 3.3.

3.2.1 Task 1 - Define Program Objectives

This task consisted of working with the NPS Task Force members, representatives from the key regulatory agencies (e.g., the RWQCB, USEPA/Region 9, USEPA/Headquarters, and several senior consultants within WCC who have long-term experience in developing and evaluating NPS controls). This task also involved viewing federal and state water quality laws and state and regional water quality policies and orders which pertain to the control of nonpoint source water pollution problems and their control.

The following objectives were set forth to guide the process of program development:

- The program should reduce both the total loads of pollutants discharged and the concentrations of pollutants in sensitive areas.

- The program should focus on controlling those pollutants which have been judged to pose the greatest potential threat to designated beneficial uses in the Lower South Bay and its tributary streams.

- The program should be focused on those pollutants for which a reasonable degree of load reduction will yield significant improvements.

Table 3-2. PROCESS FOR DEVELOPING THE RECOMMENDED AREAWIDE NPS CONTROL PROGRAM

Task 1 - Define program objectives

Task 2 - Develop evaluation and planning criteria

Task 3 - Compile inventory of candidate control measures

Task 4 - Apply criteria to screen candidates

Task 5 - Apply professional judgement to select a practical set of controls

Task 6 - Estimate overall program costs and effectiveness

Task 7 - Revise the previously defined control programs to balance cost, effectiveness, and other factors

Task 8 - Describe the respective roles of the jurisdictions and agencies who will implement the NPS control program

Task 9 - Develop the schedule for implementing the areawide NPS control program and for developing local control programs

- The program should attempt to achieve water quality benefits in as many receiving waters as possible (e.g., small streams, large streams, the Lower South Bay).

- The program should employ control measures which have been shown to be cost-effective, reliable, and sustainable.

- The program should employ control measures that have been shown to have minimal attendant environmental side effects, are generally acceptable to the public, and will not introduce significant risks to public health or safety.

- The program should include elements that satisfy (or are consistent with) the requirements and objectives of existing and foreseeable federal and state water quality control programs.

- The areawide NPS control program should be designed so that it can serve as a model which can be used to guide the subsequent development of more specialized local NPS control programs.

- The areawide program should employ primarily those controls which are equitable and cost-effective to implement on an areawide basis (i.e., controls which provide significant benefits only in specific circumstances should be considered for local programs but not included in the areawide program).

- The areawide program should be designed to be implemented in a series of well-defined phases (according to an implementation schedule which can be incorporated into the forthcoming NPDES permit).

3.2.2. Task 2 - Develop Evaluation and Planning Criteria

This task consisted of developing the criteria the project team later used to screen through various candidate control measures and to select those which appear to be the most practical ones to include in the areawide NPS control program.

These criteria were employed during two different tasks. Screening criteria were used in Task 4 to sort through a broad spectrum of control measures which have been considered at other locations. Selection criteria were used in Task 5 to designate a practical set of control measures which will be implemented together in the form of the recommended areawide NPS control program. The screening and selection criteria provided a means of considering the following factors, all of which have an important bearing on the control program's feasibility and effectiveness:

- Pollutants Controlled
- Effectiveness
- Reliability/Sustainability
- Implementation Costs
- Continuing Costs
- Equitability
- Universality
- Public Acceptability
- Agency Acceptability
- Relationship to Regulatory Requirements
- Risk/Liability
- Environmental Implications

Each of these factors is explained in Section 3.3.1.

3.2.3 Task 3 - Compile Inventory of Candidate Control Measures

This task consisted of reviewing technical literature and NPS control programs developed for other areas to develop a large inventory of candidates from which to select. WCC also drew upon the experience of its own personnel and interviewed technical and managerial personnel from several other state agencies, county agencies, and city public works and planning agencies to draw upon experience derived from other NPS studies and water quality planning programs. This effort yielded a comprehensive list of more than 120 separate control measures. Some of these candidates had originally focused on very local conditions and would have little or no application in the Santa Clara Valley. Also, some of these candidates involved practices and/or facilities which are now regarded as ineffective (or at least not sufficiently cost-effective). However, many of the candidates were well worth considering for use in the study area.

3.2.4 Task 4 - Apply Criteria to Screen Candidates

This task consisted of a two-step process of screening the comprehensive list of control measures to yield a smaller, more manageable list which helped to focus attention on the more promising candidates.

As noted previously, the list of candidates compiled in Task 3 was intended to be comprehensive. Therefore, it included numerous control measures that have been tried (or at least suggested for use) in other communities. In this task, the project team used published information, knowledge gained from nearly 20 years of experience in evaluating NPS controls, and professional judgement to screen through the comprehensive list of candidates. The criteria developed during Task 2 were used to structure and guide the screening process, which was conducted in two steps, as follows.

The first step consisted of eliminating those candidates that were judged to be clearly "not applicable". Most of these were control measures that had originally been directed toward some very localized physical or institutional situations. These situations may have been relevant to the communities where the controls were originally proposed, but they do not have known counterparts in the Santa Clara Valley study area.

The second step consisted of evaluating and assigning grades to each remaining candidate. For convenience, the grading system was made to emulate that used in most schools (i.e., A through F). The team reviewed all of the candidates and scored them relative to the screening criteria developed in Task 2. The candidates that had been given a grade of "F" were eliminated from further evaluation, because they failed to offer enough promise to warrant their further assessment for the areawide NPS control program.

3.2.5 Task 5 - Apply Professional Judgement to Select a Practical Set of Controls

This task consisted of compiling lists of the candidate control measures in several different arrangements, and then selecting especially promising candidates to include in three alternative areawide NPS control programs. The task was performed in two steps, as described below.

In the first step of Task 5, the list of candidates was compiled into two arrangements, as follows:

- Compilation by function. The candidates from Task 4 were compiled in terms of how they would function in a physical sense. Some candidates are considered to be "source controls" which function by preventing pollutants from entering the stormwater (e.g., an effective community disposal program for waste oil, antifreeze, and pesticides would prevent these pollutants from being improperly disposed of via the storm drain system. Such a program is considered to be a source control measure). Some candidates are considered to be "hydraulic controls" which function by altering the storm runoff hydrograph, which can result in reductions of both pollutant concentrations and loading rates (e.g., site drainage facilities that temporarily retain part of a storm's runoff and/or facilitate infiltration can alter storm runoff hydrographs and are considered to be hydraulic control measures). Some candidates are considered to be "treatment-based controls" which function by removing pollutants after they have already entered the storm runoff (e.g., detention basins constructed to remove settleable pollutants by sedimentation are considered to be treatment-based control measures).

- Compilation by mode of implementation. The candidates from Task 4 were also compiled in terms of how they would be implemented. Some controls would be implemented primarily through various forms of "education" (e.g., programs which use various forms of education, public information, and/or technology transfer to explain the principals and correct practices of NPS control to the general public or to specially targeted audiences are considered here to be educational control measures). Some controls would be implemented through new or amended "regulatory" or public policy directives (and associated inspection, detection, and enforcement activities). Some controls would be implemented through efforts by "public agencies" (e.g., the efforts of planning departments, public works departments, and/or other public agencies that would conduct inspections, provide maintenance and/or repair services, build new facilities, and perform other public agency functions).

The second step of Task 5 consisted of applying the selection criteria (developed in Task 2) and selecting the most appropriate candidates to include in one or more of three alternative areawide NPS control programs. Each alternative program was designed to be a well-balanced, strategic approach to controlling NPS pollutants on an areawide basis. The alternative programs were designed to differ in terms of their cost, effectiveness, and ease of implementation. As described in Section 3.3.4, Program II was designed to be the one recommended for areawide implementation (to be supplemented by local actions in specific communities, as may be appropriate). Programs I and III were designed to provide lesser and greater degrees of pollution control effectiveness, respectively, and would have correspondingly lower and higher costs, respectively. This approach was taken to provide a means of assessing the general relationships between cost and effectiveness. It should be noted that Program II includes all of the control measures which comprise Program I, plus several additional measures. Similarly, Program III includes all of the control measures which comprise Program II, plus several additional measures. These relationships are explained and illustrated in Section 3.3.4.

It should also be noted that the project team did not select every one of the candidate control measures identified in Task 4 when it developed the three alternative areawide NPS control programs. Some of the controls that were not selected could still become valuable candidates for one or more of the local implementation programs that will be developed for specific communities.

3.2.6 Task 6 - Estimate Overall Program Costs and Effectiveness

This task considered the cost and the effectiveness of the recommended areawide NPS control program (Program II) and the two postulated alternatives (Programs I and III). As discussed elsewhere, the various water quality regulatory agencies have not prescribed numerical regulations, standards, objectives, stipulations, or performance specifications which could be used as target levels to guide the process of developing and assessing the effectiveness of the areawide NPS control program. This situation presents difficulties, in that the project team was compelled to propose a solution to a problem that has not been fully described, to evaluate that solution in terms of how well it would solve the problem, and then to estimate what the solution would cost. The project team's efforts were further challenged by the fact that the costs and effectiveness of most available NPS control measures are not well documented, and the specific locations of application cannot be fully defined at this early stage of planning.

The approach used in Task 6 was as follows:

- Define the specific control measures which the team judged to be most applicable to each of the three alternative areawide NPS control programs.
- Develop first-order estimates of the costs associated with implementing these alternative control programs at reasonable levels of intensity.
- Perform a realistic budget allocation which assigned appropriate levels of funding to support the control measures which comprise the three alternative programs.
- Make first-order estimates of the programs' probable effectiveness in controlling the most important types of pollutants (i.e., heavy metals, pesticides and herbicides, oil and grease, bacteria, and sediments).
- Assess the implications of adopting alternative programs (i.e., Program I or Program III) in lieu of the Program II (the recommended program), expressed in terms of different costs and different levels of effectiveness.

3.2.7 Task 7 - Revise the Previously Defined Control Programs to Balance Cost, Effectiveness, and Other Factors

This task provides an opportunity to revise the areawide NPS control programs that were developed in Task 5. This task has not been conducted at the present stage of planning. However, it may be necessary, to account for the fact that some of the control measures may have unacceptably high costs and/or may have some attributes which the NPS Task Force may consider to be very important (such considerations may need to partly override evaluations based primarily upon cost and effectiveness). Examples of such measures are those which are virtually mandated by regulatory agencies. Some of these will have costs and/or effectiveness that are very difficult to quantify, yet they should be included in Program II because they are required by new regulations and are undoubtedly worthwhile to implement. Examples include efforts to identify and control illicit discharges and illegal dumping of pollutants in storm sewers and drainage channels.

3.2.8 Task 8 - Describe the Respective Roles of the Jurisdictions and Agencies That Will Implement the NPS Control Program

This task consisted of beginning the process of determining appropriate roles and responsibilities for the 13 participating South Bay cities, the County of Santa Clara, and the SCVWD. The specific roles and responsibilities for each jurisdiction and respective agency will have to be worked out over time. Part of this process will take place over the next several months, as the parties develop the scope and conditions of the NPDES permit they will apply for collectively. Part will take place over the next few years, as the parties conduct the local planning efforts and control measure evaluations that will be stipulated in the NPDES permit. Task 8 consisted of making a first pass through the subject to indicate the project team's views of the participants' respective roles and responsibilities.

3.2.9 Task 9 - Develop the Schedule for Implementing the Areawide NPS Control Program and for Developing Local Programs

This task consisted of defining mileposts within the recommended areawide NPS control program and developing a schedule to guide its implementation. Task 9 involved describing the sequence and timing of the various planning efforts which the 13 participating cities, the County, and the SCVWD will take as they develop their NPDES permit application and their respective local control programs. Most of the individual control measures which comprise the recommended areawide NPS control program will be implemented in a step-wise fashion. In Task 9, the project team defined the appropriate steps, assigned corresponding preliminary target dates, and plotted these on a schedule diagram. During the development of the NPDES permit application, representatives from the cities, the County, and SCVWD will review and refine the preliminary schedule.

3.3 RESULTS OF THE PLANNING PROCESS

As described in Section 3.2, the process of developing the recommended areawide NPS control program was conducted in nine discrete tasks, each of which had a tangible output. This section describes the results of the process.

3.3.1 Evaluation and Planning Criteria

Tasks 1 and 2 involved efforts to define the objectives of the areawide NPS control program and to develop evaluation and planning criteria which could guide the process of developing an effective program. The product of Task 2 was a list of criteria that were used twice: first in Task 4 to screen the comprehensive list of candidate control measures and second in Task 5 to select specific measures to include in the recommended areawide NPS control program. The criteria developed in Task 2 dealt with the following factors:

- Pollutants Controlled - Candidates were evaluated to be sure that, collectively, they would provide a desired degree of control for the most important NPS pollutants. Candidates that are likely to provide a relatively high degree of control for less important pollutants were included in some cases, but emphasis was placed on the following types of pollutants: heavy metals, pesticides and herbicides, oil and grease, bacteria, and sediments.

- Effectiveness - Candidates were evaluated to be sure that they would afford a reasonable increment of control for the important pollutants. It is recognized that each NPS control measure, taken independently, would not have much effect on the overall areawide NPS pollutant loading problem. However, it is intended that each individual control measure should contribute enough toward the overall program to warrant its inclusion.

- Reliability/Sustainability - Candidates were evaluated to consider how well they would perform over time. "Reliability" refers to the measure's ability to function in a predictable manner to effectively control pollutants, if properly implemented. This is an important consideration, because some controls are not very effective during sizeable storm runoff events and/or are unpredictable in terms of their performance. "Sustainability" refers to the measure's likelihood of being properly implemented over a long time period. This is an important consideration for those controls that depend upon volunteer efforts and/or the consciousness and cooperation of the public to perform properly.

- Implementation Costs - Candidates were evaluated regarding the approximate magnitude of the various costs involved in their initial implementation. These varied significantly from measure to measure. Implementation costs considered here included such one-time cost items as planning, design, land acquisition, construction, and equipment acquisition.

- Continuing Costs - Candidates were evaluated regarding the approximate magnitude of costs associated with operations, maintenance, repair, support services, and periodic equipment replacement (where applicable). For some measures, this would include electric power, fuel, replacement parts, monitoring programs, laboratory services, consulting services, legal services, and other continuing costs.

- Equitability - Candidates were evaluated regarding the degree to which their associated costs and resultant benefits would be considered generally equitable. In some cases, it may be necessary (or at least expedient) to implement a control which is considered to be inequitable (i.e., the party who will pay for the control is not the party who caused the problem and/or will not receive the benefit of the control). Evaluation of candidate controls relative to this criteria was an attempt to avoid such cases.

- Universality - Candidates were evaluated regarding the degree to which their implementation would be practical only if achieved on a very large geographic scale. For example, the lead content of urban runoff has diminished significantly in response to a decade of concerted regulatory requirements and technical actions to reduce the lead content of gasoline, paint, and other products. Similar large-scale actions may be capable of reducing other NPS pollutants. Candidate control measures were evaluated here in terms of how universally they would have to be applied to achieve significant benefits. This can be an important consideration because it can have significant cost, schedule, and political implications.

- Public Acceptability - Candidates were evaluated in terms of how readily the public would be likely to accept them. Such evaluations are clearly subjective and depend heavily upon the segment of the "public" most affected, and that public's knowledge, understanding, and attitudes regarding the control measure and its purpose. This latter factor can often be influenced by focused education and public information programs. However, for this project, it was assumed that the public's present level of understanding and attitudes would facilitate some control measures and hinder others.

- Agency Acceptability - Candidates were evaluated in terms of how readily various public agencies would be likely to accept them. This factor was not found to be especially useful in evaluating control measures for the areawide NPS control program, because agency acceptability would be too difficult to forecast, given the many other factors that influence public agencies' attitudes and policies (both official and de facto). However, it may be possible to consider this factor when developing local NPS control programs.

- Relationship to Regulatory Requirements - Candidates were evaluated in terms of their consistency with present and anticipated regulatory requirements. The USEPA, the SWRCB, and the RWQCB are all presently developing programs and policies which will require the implementation of certain NPS control measures. Candidate control measures that are likely to be required by federal, state, and/or regional regulatory actions were given higher priority (if they appear to be generally cost-effective) in both the screening and the selection process than those which are more elective.

- Risk/Liability - Candidates were evaluated in terms of the risks or liabilities which might accompany their implementation. In some cases, the problems associated with risk and/or liability might well be more important than their cost or their effectiveness in controlling NPS pollution problems.

- Environmental Implications - Candidates were evaluated regarding the potential environmental impacts and benefits which might derive from their use. Most of the control measures would have only positive environmental implications; however, the development and operation of some of the larger-scale treatment-based controls and some of the maintenance controls listed under Public Agency Actions could have some adverse environmental attributes which warrant consideration.

3.3.2 Inventory of Candidate Control Measures

This effort yielded a comprehensive list of more than 120 separate control measures, which included entries that have been tried (or at least considered for use by planners, engineers, and/or public interest groups at other locations. Some of these were judged to be not applicable to the overall Santa Clara Valley study area. Therefore, the overall inventory is not presented here. Rather, a more relevant list (which was developed by applying the above-described screening criteria) is presented in Section 3.3.3.

3.3.3 Application of Criteria to Screen Candidates

This was conducted in two steps. The first screening step consisted of eliminating those candidates that were judged to be clearly "not applicable" for the areawide NPS control program for the Santa Clara Valley study area (largely because they were developed to address situations which either do not exist in the study area and/or because they are too narrow in their focus to be included in the areawide program).

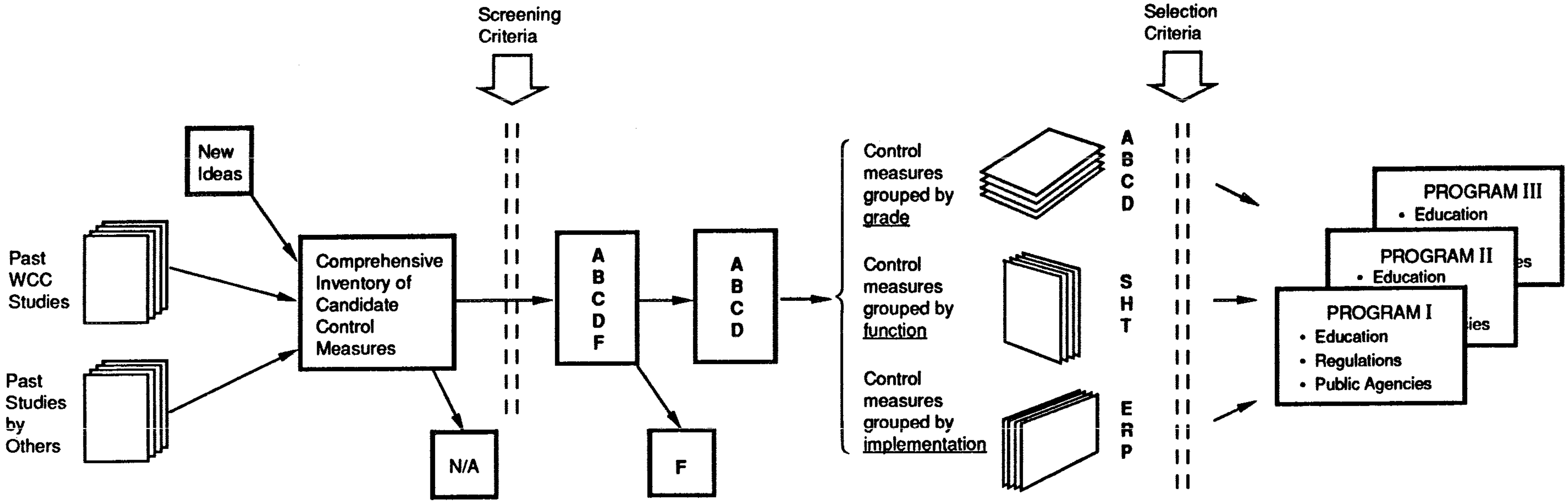
The second screening step consisted of evaluating and grading the remaining 92 candidate control measures. During this step, the project team considered the screening criteria (from Task 2), assigned grades (A through F), and produced two lists of control measures. The candidate control measures that received grades of A through D are listed in Appendix A. The measures that received a grade of F are listed in Appendix B. (Note that these tables have been placed in an appendix to minimize the chance of their being mistaken for the recommended control program.) As noted elsewhere, some of these measures may still hold promise for local applications and may warrant consideration when the specific jurisdictions develop their local implementation programs.

3.3.4 Use of Professional Judgement to Select Practical Sets of Controls

The preferred candidate control measures were first compiled in several alternative arrangements, and then the project team selected candidates to include in the three alternative areawide NPS control programs. In Task 4, the list of candidates has been arranged by letter grade. In this task, the list was rearranged and the control measures were listed in terms of how they would function and how they would be implemented. This process of screening through, arranging, and selecting candidate control measures is illustrated in the network diagram of Figure 3-1.

The functional categories considered here were as follows:

- Source controls - These would function by preventing pollutants from entering the stormwater. Some degree of source control would be accomplished by influencing how people use and dispose of potentially harmful chemicals and wastes. Some would be accomplished by controlling erosion, by locating and controlling illicit discharges from commercial/industrial sewers, and by locating and correcting improper cross-connections between sanitary sewers and storm drains. Source controls can also include improved or specially targeted public works practices such as street sweeping and catchbasin and storm sewer cleaning. Control measures directed toward the sources of NPS pollutants are very important, because they deal with the pollutants in their most concentrated forms (i.e., when they are most easily detected, most easily controlled, and most likely to cause impacts). Moreover, source controls are often more likely to be equitable (i.e., they often provide opportunities to place the burden of control directly on the parties who are responsible for the problems). However, by definition, "sources" of "nonpoint source" pollution problems are often difficult to locate. Furthermore, the effectiveness of source controls often depends upon the



LEGEND

- **A, B, C, and D are letter grades.**
- **S, H, and T are functions** (ie., Source controls, Hydraulic controls, Treatment-based controls).
- **E, R, and P are modes of implementation** (ie., Education, Regulation, Public Agency Actions).

Figure 3-1. NETWORK DIAGRAM ILLUSTRATING PROCESS OF DEVELOPING AREAWIDE NPS CONTROL PROGRAM

effectiveness of efforts to locate and actually control the source; and/or cooperative participation by the people responsible for the source. Experience with source control programs has shown the need for continuing efforts to educate and motivate the people involved (both the potential polluters and the people responsible for program implementation and enforcement). Table A-1 (in Appendix A) lists the candidates that are considered to be source controls.

- Hydraulic controls - These would function by altering the storm runoff hydrograph and are intended to reduce pollutant concentrations and/or loading rates. The concept of controlling pollutants by reducing peak flow rates in the stormwater drainage system is sometimes viewed as being of questionable value, until one considers the fact that many pollutants have a tendency to accummulate within the system and then later be flushed out during times of high discharge. The 1988-89 field studies (described in Volume I) clearly indicate the relationship between high pollutant concentrations and high loading rates during large runoff events. Therefore, hydraulic controls, which function by altering the runoff hydrograph in various ways, provide some opportunity to control pollutants. Some hydraulic controls involve various ways of temporarily retaining precipitation and keeping this water from entering the remainder of the runoff during the period of maximum streamflow. Examples include modified roof drains, on-site retention ponds, and special landscaping to facilitate infiltration. Table A-2 (in Appendix A) lists the candidates that are considered to be hydraulic controls.

- Treatment-based controls - These would function by removing pollutants after they have already entered the storm runoff. Examples of treatment-based controls include a diverse variety of small-scale and large-scale facilities which remove pollutants from the runoff by means of physical, chemical, and/or biological means. These include oil and grease traps, silt traps, and detention basins (of various sizes and designs) which depend primarily upon gravitational forces to separate pollutants which will float or settle out, given the proper conditions. Additional types and amounts of pollutants can be removed by treatment-based controls which also employ vegetation in the basins and/or conveyance channels, because the vegetation can provide both improved opportunities for physical removal and can introduce effective chemical/biochemical processes. Grassy swales and artificial wetlands are examples of vegetated treatment-based controls that have been used effectively in many locations to control NPS pollutants.

The basic problems common to all treatment-based controls are the need for suitable land area to physically accommodate the control facilities; the inherent need to match the facilities' throughput capacity to the runoff rate (i.e., large storm runoff volumes might pass through with little pollutant removal, very large storm runoff volumes might damage the facilities and/or scour out pollutants that had been removed from previous storms); and the inherent need to monitor and properly maintain the facilities (to optimize performance and avoid nuisance conditions and potential environmental impacts).

The inherent benefits of treatment-based controls are significant enough to make them attractive to public agencies. They are viewed by many as being more tangible and, therefore, easier to monitor, in that one can easily verify their performance by directly observing the pollutants they remove. Their performance is also far less dependent upon the intangible human factors that limit source controls (i.e., the effectiveness of education, inspection, and enforcement campaigns). Table A-3 (in Appendix A) lists the candidates that are considered to be treatment-based controls.

The implementation categories considered here were as follows:

- Educational controls - These control measures would be implemented through various forms of education, public information, and/or technology transfer. The term "educational," as used here, includes a broad variety of actions and methods which are intended to inform various people and organizations about things they should do and should not do to help reduce NPS pollution problems. These measures will be designed to inform carefully targeted audiences (e.g., the public at large, commercial/industrial interests, land developers and contractors, consulting engineers/planners/architects, city and county personnel). Some of the educational methods that will be considered here will include fliers/brochures/pamphlets, newsletters, newspaper articles, slide/video presentations, seminars/workshops, class curricula, radio/TV spots and interviews, speaker bureaus, hotlines, "bulletin boards," signs/billboards, guided field trips, and a variety of other methods and media. These educational efforts will be directed toward the target audiences in ways that make the best use of public resources and the public's interest. Particular attention will be directed toward coordinating the educational control measures with the interested environmental groups, conservation groups, volunteer organizations, and youth organizations that are active in Santa Clara and elsewhere in the Bay Area.

- Regulatory controls - These control measures would be implemented by establishing and enforcing new or amended regulations and/or public policies.

- Public agency actions - These control measures would be implemented through the efforts of planning departments, public works departments, and other public agencies that would conduct reviews and inspections, provide maintenance and/or repair services, build new facilities, and perform other public agency actions.

The second step of Task 5 consisted of applying the criteria (from Task 2) to select the most appropriate candidates to include in each of three alternative areawide NPS control programs. Each of these three alternative programs was designed to be a well-balanced, strategic approach to controlling NPS pollutants on an areawide basis. The three alternative programs were specifically designed to differ from one another in terms of their respective cost, effectiveness, and ease of implementation. The recommended program (designated here as Program II) is believed to represent the best compromise among the many factors considered in this study.

The alternative programs considered here are as follows:

- Program I - This was designed to be a smaller-scale alternative to Program II. It was designed to be simpler and less costly, but would also be less effective. It is not recommended but was defined for the purpose of helping decision makers consider the general implications of conducting a smaller-scale program. The control measures that make up Program I are listed in Appendix C (note that Program I is described in an appendix to minimize the chance of its being mistaken for the recommended program). Program I includes "educational" measures E1 through E17, "regulatory" measures R1 through R5, and "public agency" measures P1 through P7.

- Program II - This was designed to be the recommended areawide NPS control program for the Santa Clara Valley study area. The control measures that comprise this program are to be implemented throughout the area, and are to be supplemented by certain local control programs which will be developed and implemented (as needed) by the 13 participating cities, the County, and the SCVWD. The control measures that make up Program II are listed in Table 3-3 (this includes all of the entries listed in Appendix C, plus several additional control measures). Program II includes "educational" measures E1 through E17, "regulatory" measures R1 through R12, and "public agency" measures P1 through P12.

- Program III - This was designed to be a larger, more costly, and more effective alternative NPS control program for areawide application. It is not recommended at this time, because there is not yet a demonstrated need for such a comprehensive, costly program. Rather, it was defined for the purpose of helping decision makers consider the general implications of conducting a larger-scale program. The control measures that make up Program III are listed in Appendix D (note that Program III is described in an appendix to minimize the chance of its being mistaken for the recommended program). Program III includes all of the entries listed in Table 3-3, plus several additional control measures. More specifically, it includes "educational" measures E1 through E17, "regulatory" measures R1 through R13, and "public agency" measures P1 through P29.

Figure 3-2 illustrates the relationship between the three above-defined programs (i.e., Program II includes all of Program I plus additional controls; Program III includes all of Program II, plus additional controls).

The above-described selection process involved a considerable amount of professional judgement. This was partly because so few constraints or requirements have been imposed as givens, and partly because there are so many promising candidates (each of which can provide only an incremental

Table 3-3. PROGRAM II - Recommended Areawide NPS Control Program.

"Educational" Control Measures

E1 Educate re: the impacts that result when oil, antifreeze, pesticides, herbicides, paints, solvents, or other potentially harmful chemicals are dumped into storm sewers or drainage channels.

E2 Educate re: the proper use (e.g., application methods, frequencies, and precautions) and proper management of fertilizers, pesticides, herbicides, and other potentially harmful chemicals.

E3 Educate re: the effective use of "housekeeping" practices, including the use of absorbents, cleaning compounds, and oil/grease traps for controlling oil and grease in gas stations, automotive repair shops, parking areas, commercial/industrial facilities, and food service facilities.

E4 Educate re: the NPS pollution impacts that result from littering and improper solid waste practices.

E5 Educate re: the need to keep rainfall and runoff from contacting potential contaminants. Describe typical examples of the problem and practical solutions.

E6 Educate re: the need to minimize both the total volume of runoff and the peak rate of runoff from a given area. Describe basic principles and suggest alternative practical means to enhance surface retention and infiltration.

E7 Educate re: the relationship between air pollution and NPS water quality problems. Coordinate with and obtain information from BAAQMD, CARB, and ABAG.

E8 Educate re: the need to intensify vehicle inspection and maintain efforts to reduce leakage of oil, antifreeze, hydraulic fluid, etc.

E9 Educate re: the environmental impacts which result from leaks and spills from gasoline, fuel oil, and chemical tanks (above and below ground).

E10 Educate architects, engineers, contractors, maintenance, and public works personnel about the need for and practical methods for erosion control, sediment control, groundwater disposal, and site waste disposal.

E11 Educate farmers, ranchers, and other managers of agricultural and/or open-space lands re: the need for and practical methods for erosion control and sediment control.

E12 Educate managers and users of park lands and open-space lands re: the need to restrict off-trail activities, and to control erosion from unpaved paths and other areas. Establish and enforce practical, site-specific regulations to control off-trail activities.

E13 Educate re: the need to clean up and properly dispose of pet wastes.

Table 3-3 PROGRAM II - Recommended Areawide NPS Control Program. (continued)

	E14	Educate re: the need to cooperate with programs (by others) which seek to reduce particulate atmospheric emissions of pollutants from individual, public, commercial, and industrial sources.
	E15	Educate re: the need to cooperate with programs (by others) which seek to reduce automobile use by various means (e.g., ride sharing, carpooling, public transportation, bicycling).
	E16	Educate re: the need to intensfiy vehicle inspection and maintenance efforts to reduce atmospheric emissions.
	E17	Educate re: the need to minimize the total runoff volume that roof drains contribute directly to storm sewers and drainage channels. Describe basic principles and suggest practical alternatives to minimize their peak rate of discharge.
"Regulatory" Control Measures	R1	Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the legal authority to control littering and the improper disposal of potentially harmful wastes.
	R2	Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the legal authority to prevent the improper disposal of soil, debris, refuse, or other pollutants into storm sewers and drainage channels.
	R3	Research, strengthen (if necessary), and enforce existing regulations which give local jurisdictions the legal authority to eliminate cross-connections, which allow sanitary sewage and/or commercial/industrial wastewater to enter storm sewers or drainage channels.
	R4	Develop and implement effective erosion and sediment control regulations, and requirements for corresponding construction inspection programs. These should apply to public-sector as well as private-sector construction programs.
	R5	Research, strengthen (if necessary), implement, and enforce regulations which will give local jurisdictions the legal authority to require site drainage designs and systems which minimize the total volume of runoff and the peak rate of runoff from new construction, where local conditions permit.
	R6	Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the authority to require oil and grease controls in areas which are significant sources (e.g., gas stations, automotive shops, wrecking yards, machine shops, commercial/industrial facilities, parking areas, and food service establishments).
	R7	Develop a rational set of development requirements and establish the framework necessary to enforce such regulations. Require major commercial, industrial, institutional, and multi-family residential building complexes to have drainage facilities that incorporate on-site retention and/or infiltration -- to assure that neither the volume of runoff nor the peak rate of runoff exceed pre-project conditions.

Table 3-3. PROGRAM II - Recommended Areawide NPS Control Program. (continued)

	R8	Require new public and private sector developments to make significant use of permeable surfaces in new landscaping, recreation areas, walkways, and parking areas to maximize infiltration (e.g., bark, gravel, other groundcover, brick, cobblestones, porous pavement). Use planted areas and/or grassy swales, where appropriate, to maximize retention and infiltration.
	R9	Coordinate with the RWQCB to be sure that potential water quality impacts are adequately considered at the time NPDES permits are issued for any discharges to storm sewers or drainage channels. Include monitoring of all pertinent constituents as a permit stipulation.
	R10	Develop and implement improved erosion and sediment control policies in the environmental elements of all General Plans (develop and adopt General Plan Amendments, where needed).
	R11	Adopt policies which require all CEQA compliance documents and site drainage designs to explicitly address the following: erosion potential, proposed erosion and sediment control plans, proposed inspection programs, related environmental impacts, and enforceable mitigation measures to minimize environmental impacts.
	R12	Develop and implement regulations which require landowners and/or tenants to provide covers (e.g., roofs, tarps) to keep rain off of areas which contain contaminants (e.g.,chemical storage areas, waste storage areas, contaminated industrial areas); and to keep runoff from draining through areas which contain contaminants.
"Public Agency' Control Measures	P1	Label storm drain inlets and provide signs along the banks of drainage channels and creeks explaining the environmental impacts of dumping wastes.
	P2	Develop and implement programs which provide convenient means for people to properly dispose of oil, antifreeze, pesticides, herbicides, paints, solvents, and other potentially harmful chemicals (recycle if possible).
	P3	Develop and implement an aggressive field program to search for, detect, and prevent dumping or routinely discharging pollutants into storm sewers and drainage channels. This may involve re-evaluating previous decisions which allowed certain relatively clean waters to be discharged to the stormwater systems.
	P4	Develop and implement an agressive field program to search for, detect, and control illicit connections of sewers which carry sanitary and/or commercial/industrial wastewater.

Table 3-3. PROGRAM II - Recommended Areawide NPS Control Program. (concluded)

P5 Determine the effectiveness of increasing the frequency of cleaning out storm sewer inlets, catchbasins, storm sewers, and drainage channels in areas where sediments and/or debris tend to accumulate. Develop and implement improved programs where appropriate.

P6 Develop and implement an aggresive field program to search for, test, remove, and properly dispose of sediment deposits (in drainage channels and streams) which contain relatively high concentrations of pollutants.

P7 Develop and implement a program which provides a means of recording the observations of field inspection and maintenance personnel, so this information can be used to help locate the source(s) of pollutants.

P8 Determine the effectiveness of retrofitting existing stormwater retention basins to function as detention basins (to trap sediments from small storm events).

P9 Conduct a feasibility study to determine the technical effectiveness, environmental impacts, costs and community benefits to be derived from building and maintaining large detention basins at several locations in the lower reaches of the watershed.

P10 Conduct a feasibility study to determine the effectiveness, environmental impacts, and costs involved with establishing, maintaining, and testing wetlands and riparian vegetation in retrofitted and/or new drainage channels.

P11 Determine the effectiveness of building, establishing, and maintaining relatively large man-made wetland basins at several location in the lower reaches of the watershed.

P12 Develop and implement an aggressive field program to search for, detect, and correct situations where rainfall and/or runoff presently contact potential contaminants.

P13 Determine the effectiveness of retrofitting storm inlets with fibrous filter devices to trap sediments from small storm events.

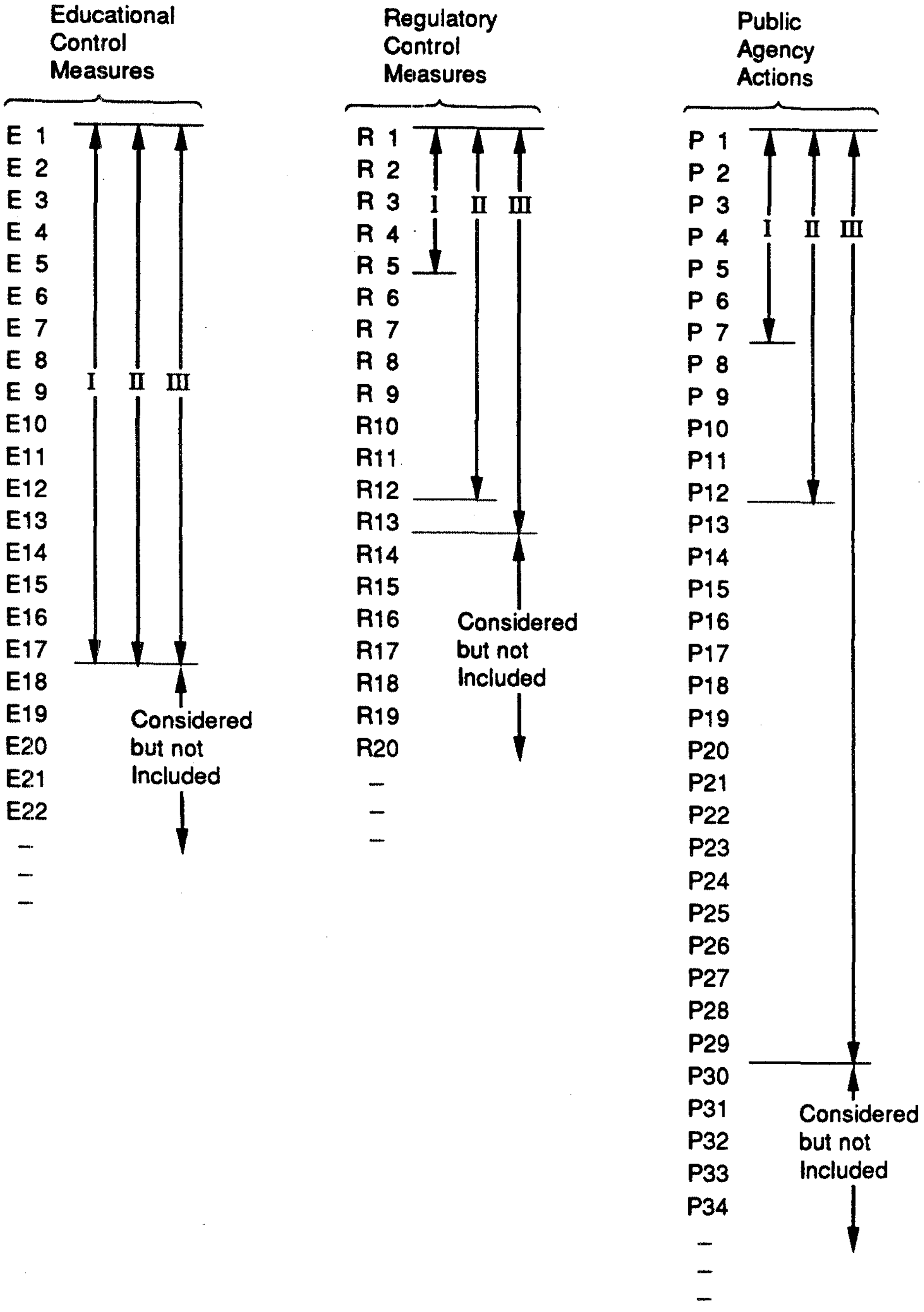


Figure 3-2. COMPARISON OF CONTROL MEASURES INCLUDED IN EACH OF THE THREE ALTERNATIVE AREAWIDE NPS CONTROL PROGRAMS

step toward the overall goal of controlling water pollution problems). The project team drew upon its understanding of NPS problems and its experience with candidate NPS controls. The team was guided by the objectives set forth in Section 3.2.1 and by a philosophical approach which evolved during the screening and selection process. In selecting the control measures to include in Program II (i.e., the recommended areawide NPS control program), the project team attempted to make selections and compromises which would accomplish the following:

- Place a heavy emphasis upon "educational" control measures, because the success of most other control measures will depend in part on the cooperation of an informed, conscious, and motivated public. Also, educational control measures, once developed, can be repeated, extended to cover greater geographic areas, and focused to deal with special "target" audiences for little additional cost. Therefore, Program II included all of the educational control measures that were judged to be practical.

- Place a significant emphasis on establishing and maintaining a broad spectrum of "regulatory" control measures. Many of these controls will be required (or at least encouraged) by the forthcoming federal stormwater regulations. Furthermore, source controls based on reasonable preventative regulations and public policies tend to be both cost-effective and equitable. Program II includes many more regulatory control measures than does Program I (see Figure 3-2). This difference accounts for most of the cost differential between these two alternatives but also is expected to make a significant addition to the program's effectiveness.

- Include some practical "public agency" actions. These will add to the cost but also the effectiveness of the program. However, they can also be expected to significantly increase the reliability and sustainability of the overall program, because they are less dependent upon intangible human factors (e.g., public consciousness and cooperation, the effectiveness of detection and enforcement).

The project team recommends Program II as the best reponse the Santa Clara Valley nonpoint dischargers can make to the present and foreseeable regulatory requirements. The program includes the best preventive measures that can be recommended (i.e., the "educational" and "regulatory" controls) and represents a good first step toward implementing public agency actions that may ultimately be required. It includes conducting some of the most promising public works measures, beginning at reasonable levels of intensity, and provides for ongoing evaluations of their performance so public works personnel can later make good decisions regarding their applicability and effectiveness under Santa Clara Valley conditions.

3.3.5 Estimates of Program Cost and Effectiveness

This task consisted of developing first-order estimates of the costs of the three alternative areawide NPS control programs and making estimates regarding each program's overall effectiveness in reducing the loading rates of important pollutants.

As discussed elsewhere, the process of estimating the costs and effectiveness of such control programs is challenging at the present stage of planning, because there are so many "unknown" factors and virtually no "given" factors. This is partly due to the high degree of program flexibility that presently exists (because specific regulatory requirements have not yet been imposed, and because public policies regarding stormwater control strategies are still in a state of flux). Also, this is partly due to technical uncertainties which are inherent at the present state of knowledge (e.g., local receiving water conditions and processes are not well-understood, there are many pollutant sources which have not been quantified, the available controls are relatively new and do not have long operational histories which provide reliable data on their cost and effectiveness, and planning efforts have not progressed far enough to fully define the appropriate scale or the best location for most of the candidate control measures).

Given this situation, the project team progressed as far as available information and professional judgement allow. This involved their pursuing the following process:

- Review the elements of the three alternative areawide NPS control programs.
- Decide upon a reasonable level of implementation for the control measures that would be implemented by each of the three major modes (i.e., "educational" controls, "regulatory" controls, and "public agency" actions).
- Develop estimated budgets which will allocate funds to cover the corresponding implementation costs and continuing costs.

It should be understood that most of the control measures could also be performed with significantly smaller or larger budget allocations, but their effectiveness would vary accordingly. The budget amounts assigned here were based upon professional judgement and are intended to represent good investments of the funds involved. Table 3-4 presents an overview of the estimated budgets for the three alternative programs.

The pollutant control effectiveness of each of the three alternative programs was estimated using professional judgement, and the project team's experience from studies performed elsewhere. Effectiveness was estimated for each of the major categories of pollutants.

The alternative programs all consist of source controls, hydraulic controls, and treatment-based controls which are to be implemented in

TABLE 3-4. COMPARISON OF ESTIMATED BUDGETS FOR THE THREE ALTERNATIVE AREAWIDE NPS CONTROL PROGRAMS.

		BUDGET ESTIMATES		
		Initial Implementation ($)	Continuing Costs ($/yr)	Annualized Costs ($/yr)
PROGRAM I (Evaluated but not recommended)	"Educational" Control Measures (E1 through E17)	480,000	482,000	594,000
	"Regulatory" Control Measures (R1 through R5)	360,000	348,000	432,000
	"Public Agency" Control Measures (P1 through P7)	187,000	180,000	224,000
	TOTALS:	1,027,000	1,010,000	1,250,000
PROGRAM II (Recommended)	"Educational" Control Measures (E1 through E17)	480,000	482,000	594,000
	"Regulatory" Control Measures (R1 through R12)	540,000	522,000	648,000
	"Public Agency" Control Measures (P1 through P12)	615,000	607,000	751,000
	TOTALS:	1,635,000	1,611,000	1,993,000
PROGRAM III (Evaluated but not recommended)	"Educational" Control Measures (E1 through E17)	480,000	482,000	594,000
	"Regulatory" Control Measures (R1 through R13)	550,000	532,000	660,000
	"Public Agency" Control Measures (P1 through P29)	1,905,000	1,842,000	2,286,000
	TOTALS:	2,935,000	2,856,000	3,540,000

various ways (e.g., through education, regulations, public agency actions). The costs and effectiveness of some control measures can be estimated with considerable accuracy. For example, physical systems such as detention basins are the easiest to assess, because they are tangible and they have been modeled, tested at pilot scale, and evaluated at full scale in demonstration projects. For other projects, the construction, operating, and maintenance costs and the corresponding pollutant removal effectiveness of detention basins have been determined with a reasonable degree of confidence. On the other hand, it is difficult to predict or verify the effectiveness of educational programs used to promote and facilitate voluntary source controls (e.g., practices for properly disposing of waste oil and antifreeze). This is partly because these types of source controls do not have long histories of use and performance, partly because the social sciences have not developed applicable predictive methodologies, and partly because their effectiveness depends upon factors (e.g., attitudes, biases) which are poorly understood and tend to be quite variable, both temporally and situationally.

Figure 3-3 illustrates the relationships among the three alternative areawide NPS control programs considered here, expressed in terms of their estimated budgets and their anticipated effectiveness. It was developed on the basis of best engineering judgement, given that specific data are not available at the present state of the art. Examination of Figure 3-3 reveals that there is a general correlation between the estimated budgets and the corresponding effectiveness of the three alternative programs considered here. Stated simply, the more comprehensive programs would cost more and provide a greater degree of pollution control (at least within the range of programs considered here). There is not enough information available to define a technically defensible endpoint for pollution control efforts. For example, it is not possible to identify some plateau (on a cost-benefit curve) that could be used as the basis for asserting that increased spending would not provide commensurate results in pollutant control (although this may well be the case).

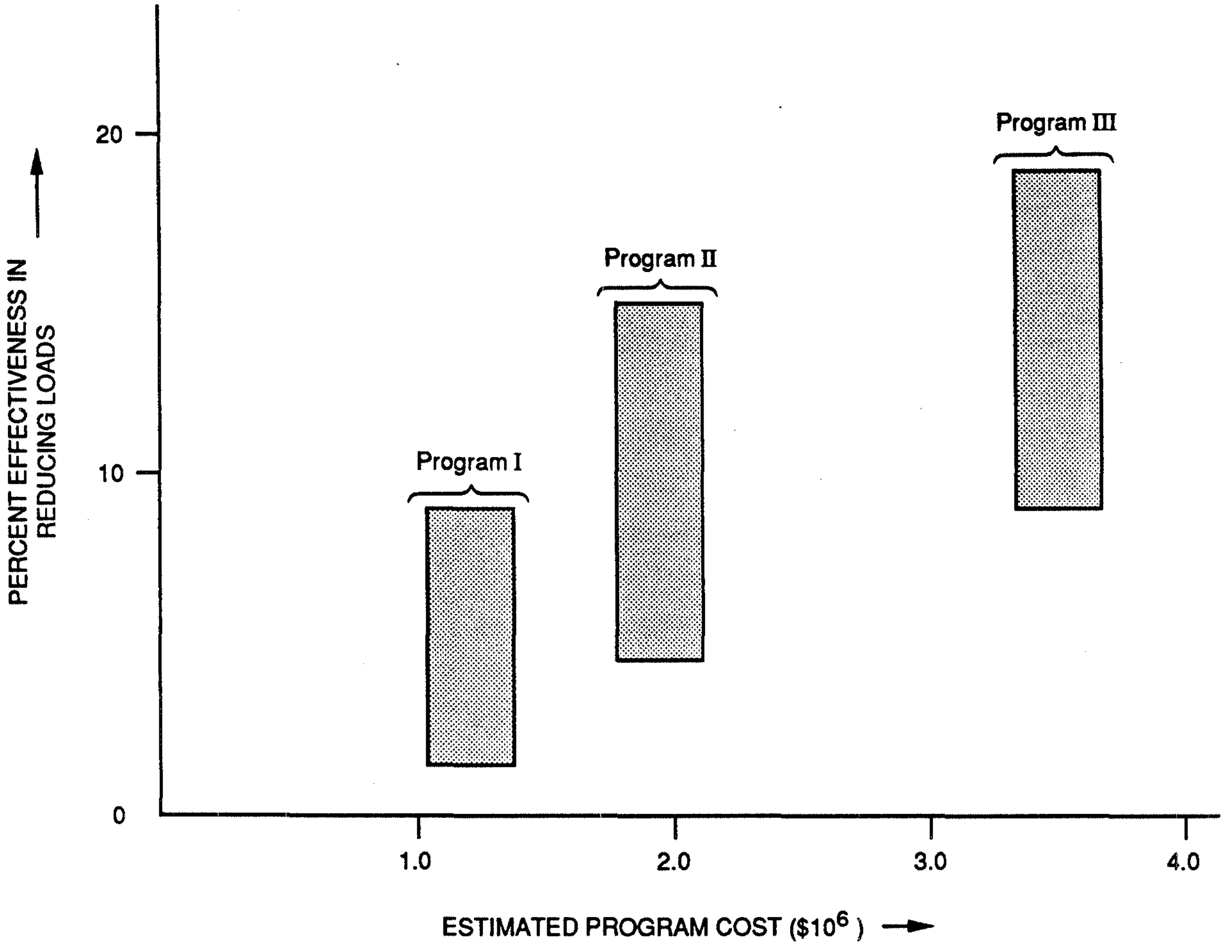


Figure 3-3. COMPARISON OF ALTERNATIVE AREAWIDE NPS CONTROL PROGRAMS ON THE BASIS OF THEIR ESTIMATED COSTS AND EFFECTIVENESS

It is recognized that the process used here to consider cost and effectiveness is a departure from the processes that are commonly used to plan and evaluate most public works programs. Here, the project team defined a set of budget items (i.e., the control measures) and allocated budget amounts to support those control measures. The allocations were made at the group level (i.e., numerous separate control measures were grouped together). Then effectiveness was estimated for entire alternative programs.

The project team decided to use this approach, because it makes the best use of known information and does not depend upon information which is not available at this time. Similar processes are commonly used in other areas of public program planning, but engineers and public works personnel are inclined to prefer more traditional methods. Examples of public programs which are compelled to plan this way include park departments, police departments, fire and emergency health services, and many social services departments. Decision makers in those areas are accustomed to facing the types of challenges inherent in planning NPS controls:

- They know what objectives they seek to attain, but they do not have prescribed quantitative standards which define how much is enough. For example, one cannot predict how many fires or crimes are likely to occur or how many resources will be expended in responding to them, nor can one expect an external agency to define what level of residual crime is acceptable.

- They use these objectives, plus their own judgement and evolving criteria to define candidate actions they could take at a given point in time.

- They decide upon what appears to be the most suitable set of actions to implement, and they assign budget amounts that they judge to represent a realistic distribution of the funds that will be available for the program (recognizing that this program must compete with other necessary uses of public funds). It is often not possible to estimate what some actions will cost, so one must simply allocate funds that are judged to be reasonable.

- They make estimates of the probable outcome of the selected actions, if performed at the allocated level of funding and personnel support. Here, too, it is often not possible to make truly quantitative estimates of program effectiveness.

- They consider the probable effects of allocating more and less support, to gain a sense of the programs' sensitivity to different allocations of support.

- They decide and then proceed with the program, looking for indications that their assumptions were right in some areas and suboptimum in others. They make corrections en route or at the next opportunity for rethinking the program and/or the budget.

It is very important for the reader to understand that the data in Table 3-4, the plots of Figure 3-3, and the above discussion are all based on first-order estimates of both cost and effectiveness. Although the project team has virtually unparalleled experience in designing and evaluating NPS control measures and developing practical control programs, there is still much to be learned in this general field. Therefore, the above information will be of greatest value to those who use it to consider qualitative trends which can help guide the forthcoming complex process of planning and implementing NPS controls.

3.3.6 Revision of Control Programs to Balance Cost, Effectiveness, and Other Factors

Task 7 has not been conducted yet. It has been included in the sequence of tasks to provide an opportunity to revise the definitions of Programs I, II, and/or III to account for factors that the NPS Task Force may want the project team to consider. It could also be used to account for the fact that some of the control measures may have attributes which partly override evaluations based primarily on cost and effectiveness. This task will be conducted, as necessary, after the NPS Task Force has had an opportunity to review and comment on the remainder of this draft report. The results of this task will be presented in the Final Report.

3.3.7 Roles of the Jurisdictions and Agencies That Will Implement the NPS Control Program

This task will be performed in several steps. The first step, which has already been performed by the project team, consisted of making a first pass through the process of defining appropriate roles and responsibilities for the 13 participating cities, the County, and the SCVWD. The first-pass results are presented in this administrative draft of Volume II as Table 3-5. This table presents an overview of the roles and responsibilities the project team has suggested for the participating cities, the County, and the SCVWD. Note that these all are keyed to Program II, the recommended areawide NPS control program.

The second and subsequent steps of this process will involve reviews by the participating agencies and jurisdictions, followed by an iterative process of deciding upon roles and responsibilities which will be described in the Final Report and can be used to structure the forthcoming NPDES permit. These later steps may involve Woodward-Clyde (in a consulting capacity), but it should be understood that such a process is likely to be more "political/institutional" than "technical" in nature.

3.3.8 Schedule for Implementing the Areawide NPS Control Program and for Developing Local Programs

In this task, the project team defined/described the process of implementing the areawide and local programs in terms of a series of steps which the NPS Task Force and representatives of the 13 participating cities, the County, and the SCVWD will have to accomplish over the next several years. The preliminary schedule for the implementation process is presented in Section 2.0 as Figure 2-1.

Table 3-5. Roles and Responsibilities for Agencies That Will Implement the Recommended Areawide NPS Control Program (First Draft).

	RECOMMENDED AREAWIDE NPS CONTROL MEASURES (Program II)	Participating Cities					Santa Clara County					SCVWD						
		Manager/Attorney	Planning	Public Works	NPS Coordinator	Other	Manager/Attorney	Planning	Public Works	NPS Coordinator	Other	General Manager	Water Quality	Environmental	Planning	Engineers	Maintenance	Other
	EDUCATIONAL CONTROLS																	
E1	Educate re: the impacts that result when oil, antifreeze, pesticides, herbicides, paints, solvents, or other potentially harmful chemicals are dumped into storm sewers or drainage channels.	ab	cd	ce	cd gk		ab	cd	ce	cd gk		a	bc dg k	cd	cd	e	e	
E2	Educate re: the proper use (e.g., application methods, frequencies, and precautions) and proper management of fertilizers, pesticides, herbicides, and other potentially harmful chemicals.	ab	cd	c	cd gk		ab	cd	c	cd gk		a	bc dg k	cd e	c	c	ce	
E3	Educate re: the effective use of "housekeeping" practices, including the use of absorbents, cleaning compounds, and oil/grease traps for controlling oil and grease in gas stations, automotive repair shops, parking areas, commercial/industrial facilities, and food service facilities.	ab	cd	c	cd gk		ab	cd	c	cd gk		a	k					
E4	Educate re: the NPS pollution impacts that result from littering and improper solid waste practices.	ab	d	ce	cd gk		ab	d	ce	cd gk		a	k					
E5	Educate re: the need to keep rainfall and runoff from contacting potential contaminants. Describe typical examples of the problem and practical solutions.	ab		ce	cg k		ab		ce	cd gk		a	k					
E6	Educate re: the need to minimize both the total volume of runoff and the peak rate of runoff from a given area. Describe basic principles and suggest alternative practical means to enhance surface retention and infiltration.	ab	ce	ce	cd gk		ab	ce	ce	cd gk		a	ce k			ce		
E7	Educate re: the relationship between air pollution and NPS water quality problems. Coordinate with and obtain information from BAAQMD, CARB, and ABAG.	ab	ce		cd gk		ab	ce		cd gk		a	k					
E8	Educate re: the need to intensify vehicle inspection and maintain efforts to reduce leakage of oil, antifreeze, hydraulic fluid, etc.	ab	cd	ce	cd gk		ab	cd	ce	cd gk		a	k					
E9	Educate re: the environmental impacts which result from leaks and spills from gasoline, fuel oil, and chemical tanks (above and below ground).	ab	cd	ce	cd gk		ab	cd	ce	cd gk		a	k					
E10	Educate architects, engineers, contractors, and public works personnel, about the need for and practical methods for erosion control, sediment control, groundwater disposal, and site waste disposal.	ab	ce g	ce g	cg k		ab	ce g	ce g	cg k		a	ce gk	ce	ce	ce	ce	
E11	Educate farmers, ranchers, and other managers of agricultural and/or open-space lands re: the need for and practical methods for erosion control and sediment control.	ab	ce g		cg k		ab	ce g	ce g	cg k		a	ce gk	ce	ce			

LEGEND:
a. Initiate / authorize program.
b. Appoint or hire staff person to coordinate program.
c. Work with in-house personnel and consultant.
d. Work with in-house personnel and volunteers.
e. Provide technical information and guidance.
f. Conduct technical studies and/or inspections.
g. Develop focused educational materials and/or work with media.
h. Research existing regulations, authority, and precedent.
i. Develop new regulations and/or policy statements.
j. Coordinate enforcement actions.
k. Coordinate with NPS Task Force.

Table 3-5. Roles and Responsibilities for Agencies That Will Implement the Recommended Areawide NPS Control Program (First Draft).

RECOMMENDED AREAWIDE NPS CONTROL MEASURES (Program II)		Participating Cities					Santa Clara County					SCVWD						
		Manager/Attorney	Planning	Public Works	NPS Coordinator	Other	Manager/Attorney	Planning	Public Works	NPS Coordinator	Other	General Manager	Water Quality	Environmental	Planning	Engineers	Maintenance	Other
E12	Educate managers and users of park lands and open-space lands re: the need to restrict off-trail activities. Establish and enforce practical, site-specific regulations to control off-trail activities.	ab	ce g		cg k		ab	ce g	ce g	cg k		a	ce gk	ce	ce			
E13	Educate re: the need to clean up and properly dispose of pet wastes.	a b	c d		cd gk		a b			cg k		a	k					
E14	Educate re: the need to cooperate with programs (by others) which seek to reduce particulate atmospheric emissions of pollutants from individual, public, commercial, and industrial sources.	ab	cd		cd gk		ab			cd gk		a	k					
E15	Educate re: the need to cooperate with programs (by others) which seek to reduce automobile use by various means (e.g., ride sharing, carpooling, public transportation).	ab	cd		cd gk		ab			cd gk		a	k					
E16	Educate re: the need to intensfiy vehicle inspection and maintenance efforts to reduce atmospheric emissions.	ab	cd		cd gk		ab			cd gk		a	k					
E17	Educate re: the need to minimize the total runoff volume that roof drains contribute directly to storm sewers and drainage channels. Describe basic principles and suggest practical alternatives to minimize their peak rate of discharge.	ab	cd	ce	cd gk		ab	cd	ce	cd gk		a	ce gk	ce	ce	ce	ce	
REGULATORY CONTROLS																		
R1	Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the legal authority to control littering and the improper disposal of potentially harmful wastes.	ab ch ij	ce	ce fi	ce gk		ab ch ij	ce	ce fi	ce gk		ai j	ce fg hik	cd e	ce	ce f		
R2	Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the legal authority to prevent the improper disposal of soil, debris, refuse, or other pollutants into storm sewers and drainage channels.	ab ch ij	ce	ce fi	ce gk		ab ch ij	ce	ce fi	ce gk		ai j	ce fg hik	cd e	ce	ce f		
R3	Research, strengthen (if necessary), and enforce existing regulations which give local jurisdictions the legal authority to eliminate cross-connections, which allow sanitary sewage and/or commercial/industrial wastewater to enter storm sewers or drainage channels.	ab ch ij	ce	ce fi	ce gk		ab ch ij	ce	ce fi	ce gk		ai j	ce fg hik	cd e	ce	ce f		
R4	Develop and implement effective erosion and sediment control regulations, and requirements for corresponding construction inspection programs. These should apply to public-sector as well as private-sector construction programs.	ab ch ij	ce	ce fi	ce gk		ab ch ij	ce	ce fi	ce gk		ai j	ce fg hik	cd e	ce	ce f		

LEGEND:
a. Initiate / authorize program.
b. Appoint or hire staff person to coordinate program.
c. Work with in-house personnel and consultant.
d. Work with in-house personnel and volunteers.
e. Provide technical information and guidance.
f. Conduct technical studies and/or inspections.
g. Develop focused educational materials and/or work with media.
i. Develop new regulations and/or policy statements.
j. Coordinate enforcement actions.
k. Coordinate with NPS Task Force.

Table 3-5. Roles and Responsibilities for Agencies That Will Implement the Recommended Areawide NPS Control Program (First Draft).

	RECOMMENDED AREAWIDE NPS CONTROL MEASURES (Program II)	Participating Cities					Santa Clara County					SCVWD						
		Manager/Attorney	Planning	Public Works	NPS Coordinator	Other	Manager/Attorney	Planning	Public Works	NPS Coordinator	Other	General Manager	Water Quality	Environmental	Planning	Engineers	Maintenance	Other
R5	Research, strengthen (if necessary), implement, and enforce regulations which will give local jurisdictions the legal authority to require site drainage designs and systems which minimize the total volume of runoff and the peak rate of runoff from new construction, where local conditions permit.	a b c h i j	c e	c e f i	c e g k		a b c h i j	c e	c e f i	c e g k		a i j	c e f g h i k	c d e	c e	c e f		
R6	Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the authority to require oil and grease controls in areas which are significant sources (e.g., gas stations, automotive shops, wrecking yards, machine shops, commercial/industrial facilities, parking areas, and food service establishments).	a b c h i j	c e	c e f i	c e g k		a b c h i j	c e	c e f i	c e g k		a	k					
R7	Require new commercial, industrial, institutional, and major multi-family residential building complexes to have drainage facilities that incorporate on-site retention and/or infiltration -- to assure that neither the total volume of runoff nor the peak rate of runoff exceed pre-project conditions.	a b c h i j	c e g i	c e f g i	c e g k		a b c h i j	c e g i	c e f g i	c e g k		a	k					
R8	Require new public and private sector developments to make significant use of permeable surfaces in new landscaping, recreation areas, walkways, and parking areas to maximize infiltration (e.g., bark, gravel, other ground cover, brick, cobblestones, porous pavement). Use planted areas and/or grassy swales, where appropriate, to maximize retention and infiltration.	a b i	g i	c e i	c e		a b i	c e	c e i	c e		a	k					
R9	Coordinate with the RWQCB to be sure that potential water quality impacts are adequately considered at the time NPDES permits are issued for any discharges to storm sewers or drainage channels. Include monitoring of all pertinent constituents as a permit stipulation.	a b c h i		c e i	c e k		a b c h i		c e i	c e k		a	k					
R10	Develop and implement improved erosion and sediment control policies in the environmental elements of all General Plans (develop and adopt General Plan Amendments, where needed).	a b h i	c e i	c e k	c e i k		a b h i	c e i	c e	c e i k		a	k	c	c			
R11	Adopt policies which require all CEQA compliance documents and site drainage designs to explicitly address the following: erosion potential, proposed erosion and sediment control plans, proposed inspection programs, and related environmental impacts.	a b c h i	c e i	c e	c e i k		a b c h i	c e i	c e	c e i k		a h i	c e i k	c e i	c e i	c e	c e	
R12	Develop and implement regulations which require landowners and/or tenants to provide covers (e.g., roofs, tarps) to keep rain off of areas which contain contaminants (e.g.,chemical storage areas, waste storage areas, contaminated industrial areas); and to keep runoff from draining through areas which contain contaminants.	a b c h i j	c e i	c e f i	c e i k		a b c h i j	c e i	c e f i	c e i k		a	k	c d e				

LEGEND:
a. Initiate / authorize program.
b. Appoint or hire staff person to coordinate program.
c. Work with in-house personnel and consultant.
d. Work with in-house personnel and volunteers.
e. Provide technical information and guidance.
g. Develop focused educational materials and/or work with media.
h. Research existing regulations, authority, and precedent.
i. Develop new regulations and/or policy statements.
j. Coordinate enforcement actions.
k. Coordinate with NPS Task Force.

NOTE:
It is recognized that cities are organized differently, and that some of the functions indicated in this table would best be performed by a different department.

Table 3-5. Roles and Responsibilities for Agencies That Will Implement the Recommended Areawide NPS Control Program (First Draft).

RECOMMENDED AREAWIDE NPS CONTROL MEASURES (Program II)	Participating Cities					Santa Clara County					SCVWD						
	Manager/Attorney	Planning	Public Works	NPS Coordinator	Other	Manager/Attorney	Planning	Public Works	NPS Coordinator	Other	General Manager	Water Quality	Environmental	Planning	Engineers	Maintenance	Other
PUBLIC AGENCY ACTIONS																	
P1 Label storm drain inlets and provide signs along the banks of drainage channels and creeks explaining the environmental impacts of dumping wastes.	ab	cd	cd e	cd ek		ab	cd	cd e	cd ek		a	cd k		cd	cd e	cd e	
P2 Develop and implement programs which provide convenient means for people to properly dispose of oil, antifreeze, pesticides, herbicides, paints, solvents, and other potentially harmful chemicals (recycle if possible).	ab hi	cd	cd e	cd eg k		ab hi	cd	cd e	cd ek		a	k					
P3 Develop and implement an aggressive field program to search for, detect, and prevent dumping or routinely discharging pollutants into storm sewers and drainage channels. This may involve re-evaluating previous decisions which allowed certain relatively clean waters to be discharged to the stormwater systems.	ab cj		ce f	cf gj k		ab cj		ce f	cf gj k		a	ce fg jk	cf		ce f	ce f	
P4 Develop and implement an agressive field program to search for, detect, and control illcit connections of sewers which carry sanitary and/or commercial/industrial wastewater.	ab cj		ce f	cf gj k		ab cj		ce f	cf gj k		a	ce fg jk	cf		ce f	ce f	
P5 Determine the effectiveness of increasing the frequency of cleaning out storm sewer inlets, catchbasins, storm sewers, and drainage channels in areas where sediments and/or debris tend to accumulate. Develop and implement improved programs where appropriate.	ab		ce f	cf jk		ab		ce f	cf jk		a	ce fj k	c		ce f	ce f	
P6 Develop and implement an aggresive field program to search for, test, remove, and properly dispose of sediment deposits (in drainage channels and streams) which contain relatively high concentrations of pollutants.	ab		ce f	cf jk		ab		ce f	cf jk		a	ce fj k	cf		ce f	ce f	
P7 Develop and implement a program which provides a means of recording the observations of field inspection and maintenance personnel, so this information can be used to help locate the source(s) of pollutants.	ab		ce	ce k		a		ce	ce k		a	ck	ce		ce	ce	
P8 Determine the effectiveness of retrofitting existing stormwater retention basins to function as detection basins (to trap sediments from small storm events).	ab h		ce k	cf k		ab h		ce f	cf k		a	k					
P9 Determine the effectiveness of building, maintaining, and testing relatively large detention basins at several locations in the lower reaches of the watershed.	ab h	ce	ce	ce fk		ab h	ce	ce	ce fk		a	ce fk	ce	ce		ce f	ce

LEGEND:
a. Initiate / authorize program.
b. Appoint or hire staff person to coordinate program.
c. Work with in-house personnel and consultant.
d. Work with in-house personnel and volunteers.
e. Provide technical information and guidance.
f. Conduct technical studies and/or inspections.
g. Develop focused educational materials and/or work with media.
h. Research existing regulations, authority, and precedent.
i. Develop new regulations and/or policy statements.
j. Coordinate enforcement actions.
k. Coordinate with NPS Task Force.

Table 3-5. Roles and Responsibilities for Agencies That Will Implement the Recommended Areawide NPS Control Program (First Draft).

RECOMMENDED AREAWIDE NPS CONTROL MEASURES (Program II)		Participating Cities					Santa Clara County					SCVWD						
		Manager/Attorney	Planning	Public Works	NPS Coordinator	Other	Manager/Attorney	Planning	Public Works	NPS Coordinator	Other	General Manager	Water Quality	Environmental	Planning	Engineers	Maintenance	Other
P10	Determine the effectiveness of establishing, maintaining, and testing wetlands and riparian vegetation in retrofitted and/or new drainage channels.	a b h	c e	c e	c e f k		a b h	c e	c e	c e f k		a	c e f k	c e f	c e		c e f	c e
P11	Determine the effectiveness of building, establishing, and maintaining relatively large manmade wetland basins at several location in the lower reaches of the watershed.	a b h	c e	c e	c e f k		a b h	c e	c e	c e f k		a	c e f k	c e f	c e		c e f	c e
P12	Develop and implement an aggressive field program to search for, detect, and correct situations where rainfall and/or runoff presently contact potential contaminants.	a b c j	c e	c e f	c f g j k		a b c j	c e	c e f	c f g j k		a	c e f g j k	c f	c e		c e f	c e f

LEGEND:
- a. Initiate / authorize program.
- b. Appoint or hire staff person to coordinate program.
- c. Work with in-house personnel and consultant.
- d. Work with in-house personnel and volunteers.
- e. Provide technical information and guidance.
- f. Conduct technical studies and/or inspections.
- g. Develop focused educational materials and/or work with media.
- h. Research existing regulations, authority, and precedent.
- i. Develop new regulations and/or policy statements.
- j. Coordinate enforcement actions.
- k. Coordinate with NPS Task Force.

4.0
RECOMMENDED MONITORING PROGRAM

4.1 INTRODUCTION

This section describes the recommended monitoring program, the purposes of which are (1) to provide additional data to characterize nonpoint source water quality and loads for years that are wetter than those encountered during this study period, (2) to evaluate the effectiveness of control measures, and (3) to conduct additional studies that would improve our understanding of the cause-effect relationships affecting runoff water quality and loads (and thereby improve our ability to design effective control measures). Section 4.2 describes the characterization monitoring, and Section 4.3 outlines a program to evaluate the effectiveness of control measures. Addition remedial studies are described in Section 4.4.

4.2 CHARACTERIZATION MONITORING PROGRAM

4.2.1 Introduction

A nonpoint source monitoring program was conducted in Santa Clara Valley during water years 1988 and 1989. The purpose of the monitoring was to characterize the flows and water quality associated with nonpoint sources, and estimate nonpoint source loads entering the Lower South Bay. The study involved a number of elements, including measurement of wet-weather and dry-weather flows, water quality monitoring, sediment quality analyses, toxicity testing, and hydrologic and water quality modeling.

Although the resultant data provide an adequate basis for characterizing NPS water quality and loads, it is desirable to conduct an ongoing monitoring program for the following reasons:

- An ongoing monitoring program is likely to be required as part of the NPDES Stormwater Permit which will apply to the Santa Clara Valley.
- Additional hydrologic and water quality data are desirable to cover more representative hydrologic conditions than those which prevailed during the relatively dry water years of 1988 and 1989.

4.2.2 Sampling Program

The characterization sampling program would consist of monitoring flow rates, sampling runoff, and analyzing samples for primarily the heavy metals which were shown to be prevalent in the runoff and which constitute a significant portion of the total (point plus nonpoint) metals load to the Bay. The samples would also be analyzed for polynuclear aromatic hydrocarbons and other constituents, as shown in Table 4-1.

Sampling would be conducted at the following five stations:

Station S1	Calabazas Creek
Station S2	Sunnyvale East Channel at Bayshore
Station S3	Guadalupe River at San Jose
Station S4	Coyote Creek at Montague Expressway
Station L2	Walsh Avenue

Stations S1 through S4 were selected from the 12 stations monitored in 1988-89, because they are the most representative of the water quality and flows that enter the Lower South Bay. The land use station at Walsh Avenue in Santa Clara (L2) was selected to provide additional data regarding an industrial site that data to date indicate has relatively high levels of selected metals.

Table 4-1. PROPOSED SUITE OF CHEMICAL ANALYSIS OF WATER QUALITY SAMPLES

Class	Constituent
Organics	Polynuclear Aromatic Hydrocarbons
Metals[*]	Arsenic Cadmium Chromium, Total Chromium, Hexavalent Copper Lead Mercury Nickel Selenium Silver Zinc
Other	TSS Conductivity Total Hardness Turbidity Temperature pH

[*] All metals are total (unfiltered).

These stations would be monitored for five storm events, including the first major event of the season, if possible. Flow rates would also be monitored by measuring water surface elevations on a continuous basis, to provide additional hydrologic data of runoff volumes entering the Bay.

Samples collected would be analyzed for the constituents in Table 4-1. Appropriate QA/QC samples would also be analyzed to evaluate laboratory accuracy and precision. The data then would be compiled in a data base and statistically analyzed and interpreted, using methods similar to those applied to the 1988-89 monitoring data.

Specific analyses would include an evaluation of annual runoff volumes and loads entering the Bay for the 1990 water year. This would be compared with the 1989 water year loads to evaluate the effects of different annual hydrologic conditions on water quality and loads.

The schedule for monitoring will depend on the hydrologic conditions, but every attempt will be made to monitor representative storms of adequate size, including the first major event of the year.

4.3 CONTROL MEASURE EFFECTIVENESS EVALUATION PROGRAM

As existing and additional control measures are implemented by the South Bay communities, it will be necessary to provide evidence to the RWQCB regarding their effectiveness in reducing nonpoint source loads to the Lower South Bay. In a way, such monitoring programs could be considered part of a performance audit.

Estimating the effectiveness of control measures through monitoring flows and water quality in streams that have relatively large catchments (as described previously in the characterization monitoring program) is difficult. This is because any trends in annual reduced loads will be difficult to observe given the large annual variability in loads and the relatively short record of years in which monitoring has been conducted.

The evaluation of the effectiveness of individual control measures will require the utilization of a number of tools depending on the type of control measure, including available performance data (e.g., as collected in the National Urban Runoff Program, computer or analytical models that predict performance (e.g., the Stormwater Management Model), and/or additional monitoring.

In many instances, these methods are complimentary. For instance, detention basin performance is relatively well-known given the site and hydrologic characteristics. Thus, it may be appropriate to conduct only a limited monitoring program to gain more confidence in the existing models by conducting a local calibration and unification. Presumably, after a performance model has been adequately tested and calibrated to better reflect local conditions, it can then be applied to other similar facilities without the need for additional monitoring.

The ability to estimate performance varies depending on the control measure. For example, it is difficult to evaluate the effectiveness of many so-called "source control" measures, such as public information and anti-littering programs. On the other hand, recycling programs may be evaluated by documenting the amount of recycled material (e.g., waste oil) that has been collected since the program was implemented.

The actual amount by which loads to the Lower South Bay will be reduced may differ from the amount collected for various reasons, and it may be appropriate to apply a factor (<1) to the total amount of material collected. This is particularly true with street sweeping, where the amount of dust and dirt removed, except at times just prior to a storm, has been shown to be relatively ineffective in reducing pollutant loads.

Control measures which have sufficient performance information to make relatively reliable performance estimates include detention basins, infiltration devices (e.g., recharge basins, grassy swales), and catchbasin cleaning. The available performance data base for other control measures (e.g., wetlands treatment) is increasing as the result of ongoing monitoring programs. Thus, the recommended program to evaluate the effectiveness of implemented controls will be developed based on the type of control, the available performance data and performance models, and the need for additional monitoring data to take into account special local conditions.

4.4 ADDITIONAL STUDIES

4.4.1 Stream Sediment Studies

Results for the 1988-1989 monitoring indicated that concentrations of constituents that tend to bind to sediments (e.g., heavy metals) were higher in stream stations than at land use stations. One hypothesis is that the higher concentrations are caused by resuspension of bottom sediments containing heavy metals. The source of the metals is unknown, but may result from dry-weather flows which contain pollutants that are adsorbed to the streambed. In other words, the sediments act as a sink during dry weather and as a source of pollutants during wet weather.

In order to improve our understanding of the role of stream sediments in affecting nonpoint source water quality and loads, it is recommended to conduct a sediment sampling program specifically designed to address this problem. For example, one test would be to examine sediment concentrations upstream and downstream of outfalls that are expected to contain heavy metals. By comparing upstream versus downstream data, it will be possible to test the hypothesis whether pollutants for dry-weather discharge are being adsorbed to stream bottom sediments.

The tests could also be conducted at intervals (e.g., once per month) throughout the dry- and wet-weather periods, to assess accumulation and resuspension. The total number of rounds would be 12, and each round would consist of perhaps six samples, three obtained upstream of the point of discharge and three obtained downstream of the point of discharge. Candidate sites might include locations where major industrial outfalls are located or locations where there are permitted discharges.

4.4.2 Pollutants Associated with Settleable Solids Fraction

The effectiveness of treatment-based controls which rely on settling depends on the distribution of pollutants between various suspended sediment fractions. For example, it is commonly felt that most pollutants tend to be associated with the silt and clay fractions; therefore, to achieve effective results it may be necessary to design detention facilities with settling times that are sufficient to capture a major portion of these finer fractions.

A recommended additional study to address this issue is to collect a sample of suspended sediment sufficiently large that various size fractions could be analyzed for heavy metals and other constituents of concern (e.g., PAHs). Such data, in conjunction with settling column information, could be used to estimate the detention time required to acheive various levels of removal. Such a test would require pumping and filtering a large volume of stormwater at a given station in order to obtain a large enough sample for the various analyses. A few tests of this nature have been conducted by various researchers, (e.g., the USGS), and these could provide information on preferred methods.

APPENDIX A
CANDIDATE CONTROL MEASURES

The control measures which are listed herein are those which were assigned scores of A through D during Task 4 of the screening process (see Sections 3.2.4 and 3.3.3). Table A-1 lists 55 candidate "source controls" which would function by preventing pollutants from entering the stormwater. Table A-2 lists 8 candidate "hydraulic controls " which would function by altering the storm runoff hydrograph. Table A-3 lists 11 candidate "treatment-based controls" which would function by removing pollutants after they have already entered the storm runoff.

TABLE A-1

CANDIDATE "SOURCE CONTROLS"

---

1. Control the Use and Disposal of Fertilizers, Pesticides, and Herbicides

   a. Educate re: the proper use (e.g., application methods, frequencies, precautions) and proper management (e.g., storing, disposing) of fertilizers, pesticides, herbicides, and other potentially harmful chemicals).

   b. Educate re: alternative methods for controlling insects and weeds (e.g., physical controls, biological controls, less toxic chemicals).

2. Control Littering and Improper Waste Disposal Practices

   a. Educate re: the NPS pollution impacts that result from littering and improper waste disposal practices.

   b. Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the legal authority to control littering and the improper disposal of potentially harmful wastes.

   c. Provide litter bags for use in cars. Work with citizen action programs to facilitate efforts to report littering incidents and illegal dumping.

   d. Develop and implement bimonthly cleanup days and corresponding curbside collection for trash and debris.

   e. Provide, collect, and maintain more litter recepticles in strategic public areas, and during major public events.

f. Coordinate with efforts (by others) to establish practical controls regarding potentially harmful packaging of consumer products.

3. Prevent the Dumping of Pollutants into Storm Sewers and Drainage Channels

a. Educate re: the impacts that result when oil, antifreeze, pesticides, herbicides, paints, solvents, or other potentially harmful chemicals are dumped into storm sewers or drainage channels.

b. Label storm drain inlets and provide signs along the banks of drainage channels and creeks explaining the environmental impacts of dumping wastes.

c. Develop and implement programs which provide convenient means for people to properly dispose of oil, antifreeze, pesticides, herbicides, paints, solvents, and other potentially harmful chemicals (recycle if possible).

d. Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the legal authority to prevent the improper disposal of pollutants into storm sewers and drainage channels.

e. Coordinate with RWQCB to be sure that all potential water quality impacts are adequately considered at the time NPDES permits are issued for any discharges to storm sewers or drainage channels. Include monitoring of all pertinent constituents as a permit stipulation.

f. Develop and implement an aggressive field program to search for, detect, and prevent dumping or routinely discharging pollutants into storm sewers and drainage channels. This should involve re-evaluating previous decisions to allow certain relatively clean waters to be discharged to the storm water systems.

4. Eliminate Cross-Connections Between Wastewater Sewers and Storm Sewers and Drainage Channels

a. Research, strengthen (if necessary), and enforce existing regulations which give local jurisdictions the legal authority to eliminate cross-connections, which allow sanitary sewage and/or commercial/industrial wastewater to enter storm sewers or drainage channels.

b. Develop and implement an aggressive field program to search for, detect, and control illicit connections of sanitary sewers and commercial/industrial wastewater sewers.

c. Develop and implement an aggressive field program to search for, detect, and control sanitary sewer leaks and areas where surcharging and/or overflows would be most likely to occur.

5. Control Oil and Grease

a. Educate re: the effective use of "housekeeping" practices, oil/grease traps including the use of absorbents, cleaning compounds and oil/grease traps, for controlling oil and grease in gas stations, automotive repair shops, parking areas, commercial/industrial facilities, and food service facilities.

b. Educate re: the need to intensify vehicle inspection and maintain efforts to reduce leakage of oil, antifreeze, hydraulic fluid, etc.

c. Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the authority to require oil and grease controls in areas which are significant sources (e.g., gas stations, automotive shops, commercial/industrial facilities, parking areas, food service establishments).

d. Develop technical guidance which will facilitate land owners' and tenants' efforts to comply with regulations requiring oil and grease controls (e.g., oil/grease traps, plate separators, synthetic absorbent media, grassy swales).

6. Control Leaks from Gasoline, Fuel Oil, and Chemical Storage Tanks.

a. Educate re: the environmental impacts which result from leaks and spills from gasoline, fuel oil, and chemical tanks (above and below ground).

b. Coordinate with efforts (by others) to intensify the implementation of existing regulations which call for improved designs for new tanks (e.g., double walls, monitoring facilities); an aggressive self-monitoring program to be conducted by landowners and tenants; and implement a strategically focused spot-check program to search for, identify, test, and control leaking storage tanks.

7. Control Erosion at Construction Sites

a. Educate architects, engineers, contractors, and public works personnel about the need for and practical methods for erosion control, sediment control, groundwater disposal, and site waste disposal.

b. Develop and implement effective erosion and sediment control regulations, and requirements for corresponding construction inspection programs. These should apply to public-sector as well as private-sector construction programs.

c. Develop and implement improved erosion and sediment control policies in the environmental elements of all General Plans (develop and adopt General Plan amendments, where needed).

d. Adopt policies which require all CEQA compliance documents and all site development plans to explicitly address the topics of erosion potential, proposed erosion and sediment control plans, proposed inspection programs, related environmental impacts, and enforceable mitigation measures to minimize environmental impacts.

e. Require contractors to post bonds to cover potential damages from erosion and/or sediment deposition.

8. Control Erosion of Undeveloped Land, Park Land, and Agricultural Land

a. Educate farmers, ranchers, and other managers of agricultural and/or open space lands re: the need for and practical methods for erosion control and sediment control.

b. Develop and implement programs to actively search for, identify, evaluate, and prioritize erosion problems on undeveloped land, park land, and agricultural land.

c. Develop and implement programs to work with landowners, tenants, and/or public agencies to apply practical erosion control and sediment control practices.

d. Educate managers and users of park lands and open-space lands re: the need to restrict off-trail activities. Establish and enforce practical, site-specific regulations to control off-trail activities.

e. Develop and implement practical programs for revegetating and otherwise restoring eroding areas (e.g., areas damaged by fires, overgrazing, landslides, improper tillage, and off-road vehicle use).

f. Restrict livestock from entering stream channels or damaging vulnerable stream bank areas.

g. Coordinate with Soil Conservation Service and local resource conservation programs to support their activities, to control erosion and sedimentation problems.

9. Control Animal Wastes

a. Educate re: the need to clean up and properly dispose of pet wastes.

b. Implement and enforce leash laws and pet waste cleanup ordinances in selected public-use areas.

c. Provide informational signs and dispense doggie litter bags in parks and other selected areas.

d. Educate re: the need for proper management of wastes from suburban livestock (e.g., horses, chickens) and agricultural operations in the watershed.

10. Control Airborne Pollutants

a. Educate re: the relationship between air pollution and NPS water quality problems. Coordinate with and obtain information from BAAQMD, CARB, and ABAG.

b. Educate re: the need to cooperate with programs (by others) which seek to reduce particulate atmospheric emissions of pollutants from individual, public, commercial, and industrial sources.

c. Educate re: the need for cooperation with programs (by others) which seek to reduce automobile use by various means (e.g., ride sharing, carpooling, public transportation, human-powered transportation).

d. Educate re: the need to intensify vehicle inspection and maintenance efforts to reduce atmospheric emissions.

e. Cooperate with public transportation agencies, public agency motorpools, and/or public works departments to provide effective air pollution controls on publically-owned vehicles and motorized equipment, and/or to use alternative clean-burning fuels where practical.

f. Educate re: the proper operation of fireplaces and wood-burning stoves to minimize the emissions of particulate matter.

11. Intensify the Maintenance/Repair of Stormwater Drainage Systems

a. Determine the effectiveness of increasing the frequency of cleaning out storm sewer inlets, catchbasins, storm sewers, storm water pump stations, drainage channels, and temporary storm water storage/retention basins in areas where sediments and/or debris tend to accumulate. Develop and implement improved programs where appropriate.

b. Develop and implement an aggressive field program to search for, test, remove, and properly dispose of sediment deposits (in drainage channels, streams and stormwater storage/retention basins) which may contain relatively high concentrations of pollutants.

c. Develop and implement a program which provides a means of recording the observations of field inspection and maintenance personnel, so this information can be used to help locate the source(s) of pollutants.

12. Improve the Maintenance of Major Paved Areas

a. Develop and implement intensified street sweeping programs in strategic locations (e.g., central business districts, shopping malls, major parking lots, industrial areas) and/or at strategic times (e.g., following extended periods of dry weather).

b. Determine the effectiveness of using street flushers to reduce pollutants in runoff.

c. Improve street sweeping on a watershed-wide basis (e.g., sweep more areas, more frequently).

d. Improve pavement repair and maintenance on streets and parking areas (e.g., fill potholes, seal cracks, apply surface treatments).

13. Prevent Rainfall and Runoff from Contacting Potential Contaminants

a. Educate re: the need to keep rainfall and runoff from contacting potential contaminants. Describe typical examples of the problem and practical solutions.

b. Develop and implement regulations which require landowners and/or tenants to provide covers (e.g., roofs, tarps) to keep rain off of areas which contain contaminants (e.g., chemical storage areas, waste storage areas, contaminated industrial areas); and keep runoff from draining through areas which contain contaminants.

c. Develop and implement an aggressive field program to search for, detect, and correct situations where rainfall and/or runoff presently contact potential contaminants.

TABLE A-2

CANDIDATE "HYDRAULIC CONTROLS"

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1. Reduce the Volume of Roof Runoff which Enters Storm Sewers and Drainage Channels

   a. Educate re: the need to minimize the total volume of runoff and the peak rate of runoff from a given area. Describe basic principles and suggest alternative practical means to enhance surface retention and infiltration.

   b. Research, strengthen (if necessary), implement, and enforce regulations which will give local jurisdictions the legal authority to prohibit new direct connections and to require retrofitting existing buildings, where necessary and practical. The objectives are to eliminate situations where the roof drains of existing buildings are connected directly to storm sewers or drainage channels. Implement and enforce regulations which minimize the degree to which new buildings will have roof drains connected directly to storm sewers or drainage channels.

   c. Provide generic plans and specifications, and demonstrate project results which will encourage architects, engineers, and building departments to implement systems which temporarily retain rainfall peaks on rooftops and/or in retention facilities to minimize the peak rate of discharge to the storm sewer system or drainage channels.

2. Enhance Surface Retention and Infiltration

a. Educate re: the need to minimize both the total runoff volume that roof drains contribute directly to storm sewers and drainage channels. Describe basic principles and suggest practical alternatives to minimize their peak rate of discharge.

b. Research, strengthen (if necessary), implement, and enforce regulations which will give local jurisdictions the legal authority to require site drainage designs and systems which minimize the total volume of runoff and the peak rate of runoff.

c. Require new commercial, industrial, institutional, and major multi-family residential building complexes to have drainage facilities that incorporate on-site retention and/or infiltration, to assure that neither the total volume of runoff nor the peak rate of runoff exceed preproject conditions.

d. Require new public- and private-sector developments to make significant use of permeable surfaces in new landscaping, recreation areas, walkways, and parking areas to maximize infiltration (e.g., vegetation, groundcover, brick, cobblestones, paving blocks, "grasscrete", porous pavement). Use planted areas and/or grassy swales, where appropriate, to maximize retention and infiltration.

e. Remove (or perforate) paved bottoms of drainage channels, where practical, to maximize infiltration and reduce peak rates.

TABLE A-3
CANDIDATE "TREATMENT-BASED CONTROLS"

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1. Provide Sedimentation Facilities to Remove Pollutants

a. Determine the effectiveness of retrofitting existing stormwater retention basins to function as detention basins (to trap sediments from small storm events).

b. Determine the effectiveness of installing in-line detention within selected reaches of large-capacity storm sewers and/or drainage channels (to trap sediments from small storm events).

c. Determine the effectiveness of retrofitting selected Sunnyvale storm sewers, sanitary sewers, and portions of the Sunnyvale POTW to allow the plant to receive and treat runoff from small storms and strategic portions of large storms.

d. Build, maintain, and assess the performance of several relatively small detention basins at selected locations in urbanized areas throughout the watershed. Begin by reviewing the operational histories of existing detention basins (e.g., Morgan Hill).

e. Determine the effectiveness of building, maintaining, and testing relatively large detention basins at several locations in the lower reaches of the watershed.

f. Determine the effectiveness of retrofitting storm inlets with fibrous filter devices to trap sediments from small storm events.

2. Employ Vegetation to Remove Pollutants from Storm Runoff

a. Determine the effectiveness of establishing, maintaining, and testing wetlands and riparian vegetation in retrofitted and/or new drainage channels.

b. Build, establish, maintain, and assess the performance of several relatively small man-made wetlands basins at selected locations in urbanized areas throughout the watershed.

c. Determine the effectiveness of building, establishing, and maintaining relatively large man-made wetland basins at several locations in the lower reaches of the watershed.

3. Provide Infiltration Basins to Remove Pollutants

a. Determine the effectiveness of retrofitting existing infiltration basins to accept and treat storm runoff.

b. Determine the effectiveness of developing in-line infiltration facilities within selected reaches of large capacity drainage channels to accept and treat storm runoff.

c. Build, maintain, and assess the performance and potential impacts of several relatively small infiltration basins at selected locations in urbanized areas throughout the watershed.

APPENDIX B
CONTROL MEASURES WHICH WERE NOT SELECTED

1 Educate re: alternative methods for controlling insects and weeds (e.g., physical controls, biological controls, less toxic chemicals).

2 Provide litter bags for use in cars. Work with citizen action groups to facilitate efforts to report littering incidents and illegal dumping.

3 Coordinate with efforts (by others) to establish practical controls regarding potentially harmful packaging of consumer products.

4 Require contractors to post bonds to cover potential damages from erosion and/or sediment deposition.

5 Restrict livestock from entering stream channels or damaging vulnerable stream bank areas.

6 Develop and implement leash laws and pet waste clean up ordinances in selected public-use areas.

7 Provide informational signs and dispense doggie litter bags in parks and other selected areas.

8 Educate re: the need for proper management of wastes from suburban livestock (e.g., horses, chickens) and agricultural operations in the watershed.

9 Educate re: the proper operation of fireplaces and wood-burning stoves to minimize the emissions of particulate matter.

10 Improve street sweeping on a watershed-wide basis (e.g., sweep more areas, and more frequently).

11 Improve pavement repair and maintenance on streets and parking areas (e.g., fill potholes ,seal cracks, apply surface treatments).

12 Develop technical guidance which will facilitate land owners' and tenants' efforts to comply with regulations requiring oil and grease controls (e.g., oil/grease traps, plate separators, synthetic absorbent media, grassy swales).

13 Research, strengthen (if necessary), implement, and enforce regulations which will give local jurisdictions the legal authority to prohibit new direct roof drain connections and to require retrofitting existing buildings, where necessary and practical. The objectives are to eliminate situations where the roof drains of existing buildings are connected directly to storm sewers or drainage channels. Implement and enforce regulations which minimize the degree to which new buildings will have roof drains connected directly to storm sewers or drainage channels.

14 Remove (or perforate) paved bottoms of drainage channels, where practical, to maximize infiltration and reduce peak rates.

15 Determine the effectiveness of installing in-line detention within selected reaches of large-capacity storm sewers and/or drainage channels (to trap sediments from small storm events).

16 Determine the effectiveness of retrofitting existing infiltration basins to accept and treat storm runoff.

APPENDIX C
PROGRAM I CONTROL MEASURES

Program I is the smaller-scale alternative areawide NPS control program. It was evaluated along with Programs II and III, but it was not recommended.

"Educational" Control Measures

E1 Educate re: the impacts that result when oil, antifreeze, pesticides, herbicides, paints, solvents, or other potentially harmful chemicals are dumped into storm sewers or drainage channels.

E2 Educate re: the proper use (e.g., application methods, frequencies, and precautions) and proper management of fertilizers, pesticides, herbicides, and other potentially harmful chemicals.

E3 Educate re: the effective use of "housekeeping" practices, including the use of absorbents, cleaning compounds, and oil/grease traps for controlling oil and grease in gas stations, automotive repair shops, parking areas, commercial/industrial facilities, and food service facilities.

E4 Educate re: the NPS pollution impacts that result from littering and improper solid waste practices.

E5 Educate re: the need to keep rainfall and runoff from contacting potential contaminants. Describe typical examples of the problem and practical solutions.

E6 Educate re: the need to minimize both the total volume of runoff and the peak rate of runoff from a given area. Describe basic principles and suggest alternative practical means to enhance surface retention and infiltration.

E7 Educate re: the relationship between air pollution and NPS water quality problems. Coordinate with and obtain information from BAAQMD, CARB, and ABAG.

E8 Educate re: the need to intensify vehicle inspection and maintain efforts to reduce leakage of oil, antifreeze, hydraulic fluid, etc.

E9 Educate re: the environmental impacts which result from leaks and spills from gasoline, fuel oil, and chemical tanks (above and below ground).

E10 Educate architects, engineers, contractors, and public works personnel, about the need for and practical methods for erosion control, sediment control, groundwater disposal, and site waste disposal.

E11 Educate farmers, ranchers, and other managers of agricultural and/or open-space lands re: the need for and practical methods for erosion control and sediment control.

E12 Educate managers and users of park lands and open-space lands re: the need to restrict off-trail activities. Establish and enforce practical, site-specific regulations to control off-trail activities.

E13 Educate re: the need to clean up and properly dispose of pet wastes.

E14 Educate re: the need to cooperate with programs (by others) which seek to reduce particulate atmospheric emissions of pollutants from individual, public, commercial, and industrial sources.

E15 Educate re: the need to cooperate with programs (by others) which seek to reduce automobile use by various means (e.g., ride sharing, carpooling, public transportation).

E16 Educate re: the need to intensfiy vehicle inspection and maintenance efforts to reduce atmospheric emissions.

E17 Educate re: the need to minimize the total runoff volume that roof drains contribute directly to storm sewers and drainage channels. Describe basic principles and suggest practical alternatives to minimize their peak rate of discharge.

"Regulatory" Control Measures

R1 Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the legal authority to control littering and the improper disposal of potentially harmful wastes.

R2 Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the legal authority to prevent the improper disposal of soil, debris, refuse, or other pollutants into storm sewers and drainage channels.

R3 Research, strengthen (if necessary), and enforce existing regulations which give local jurisdictions the legal authority to eliminate cross-connections, which allow sanitary sewage and/or commercial/industrial wastewater to enter storm sewers or drainage channels.

R4 Develop and implement effective erosion and sediment control regulations, and requirements for corresponding construction inspection programs. These should apply to public-sector as well as private-sector construction programs.

R5 Research, strengthen (if necessary), implement, and enforce regulations which will give local jurisdictions the legal authority to require site drainage designs and systems which minimize the total volume of runoff and the peak rate of runoff from new construction, where local conditions permit.

"Public Agency" Control Measures

P1 Label storm drain inlets and provide signs along the banks of drainage channels and creeks explaining the environmental impacts of dumping wastes.

P2 Develop and implement programs which provide convenient means for people to properly dispose of oil, antifreeze, pesticides, herbicides, paints, solvents, and other potentially harmful chemicals (recycle if possible).

P3 Develop and implement an aggressive field program to search for, detect, and prevent dumping or routinely discharging pollutants into storm sewers and drainage channels. This may involve re-evaluating previous decisions which allowed certain relatively clean waters to be discharged to the stormwater systems.

P4 Develop and implement an agressive field program to search for, detect, and control illicit connections of sewers which carry sanitary and/or commercial/industrial wastewater.

P5 Determine the effectiveness of increasing the frequency of cleaning out storm sewer inlets, catchbasins, storm sewers, and drainage channels in areas where sediments and/or debris tend to accumulate. Develop and implement improved programs where appropriate.

P6 Develop and implement an aggresive field program to search for, test, remove, and properly dispose of sediment deposits (in drainage channels and streams) which contain relatively high concentrations of pollutants.

P7 Develop and implement a program which provides a means of recording the observations of field inspection and maintenance personnel, so this information can be used to help locate the source(s) of pollutants.

APPENDIX D
PROGRAM III CONTROL MEASURES

Program III is the larger-scale alternative areawide NPS control program. It was evaluated along with Programs I and III, but it was not recommended.

"Educational" Control Measures

E1 Educate re: the impacts that result when oil, antifreeze, pesticides, herbicides, paints, solvents, or other potentially harmful chemicals are dumped into storm sewers or drainage channels.

E2 Educate re: the proper use (e.g., application methods, frequencies, and precautions) and proper management of fertilizers, pesticides, herbicides, and other potentially harmful chemicals.

E3 Educate re: the effective use of "housekeeping" practices, including the use of absorbents, cleaning compounds, and oil/grease traps for controlling oil and grease in gas stations, automotive repair shops, parking areas, commercial/industrial facilities, and food service facilities.

E4 Educate re: the NPS pollution impacts that result from littering and improper solid waste practices.

E5 Educate re: the need to keep rainfall and runoff from contacting potential contaminants. Describe typical examples of the problem and practical solutions.

E6 Educate re: the need to minimize both the total volume of runoff and the peak rate of runoff from a given area. Describe basic principles and suggest alternative practical means to enhance surface retention and infiltration.

E7 Educate re: the relationship between air pollution and NPS water quality problems. Coordinate with and obtain information from BAAQMD, CARB, and ABAG.

E8 Educate re: the need to intensify vehicle inspection and maintain efforts to reduce leakage of oil, antifreeze, hydraulic fluid, etc.

E9 Educate re: the environmental impacts which result from leaks and spills from gasoline, fuel oil, and chemical tanks (above and below ground).

E10 Educate architects, engineers, contractors, and public works personnel, about the need for and practical methods for erosion control, sediment control, groundwater disposal, and site waste disposal.

E11 Educate farmers, ranchers, and other managers of agricultural and/or open-space lands re: the need for and practical methods for erosion control and sediment control.

E12 Educate managers and users of park lands and open-space lands re: the need to restrict off-trail activities. Establish and enforce practical, site-specific regulations to control off-trail activities.

E13 Educate re: the need to clean up and properly dispose of pet wastes.

E14 Educate re: the need to cooperate with programs (by others) which seek to reduce particulate atmospheric emissions of pollutants from individual, public, commercial, and industrial sources.

E15 Educate re: the need to cooperate with programs (by others) which seek to reduce automobile use by various means (e.g., ride sharing, carpooling, public transportation).

E16 Educate re: the need to intensfiy vehicle inspection and maintenance efforts to reduce atmospheric emissions.

E17 Educate re: the need to minimize the total runoff volume that roof drains contribute directly to storm sewers and drainage channels. Describe basic principles and suggest practical alternatives to minimize their peak rate of discharge.

"Regulatory" Control Measures

R1 Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the legal authority to control littering and the improper disposal of potentially harmful wastes.

R2 Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the legal authority to prevent the improper disposal of soil, debris, refuse, or other pollutants into storm sewers and drainage channels.

R3 Research, strengthen (if necessary), and enforce existing regulations which give local jurisdictions the legal authority to eliminate cross-connections, which allow sanitary sewage and/or commercial/industrial wastewater to enter storm sewers or drainage channels.

R4 Develop and implement effective erosion and sediment control regulations, and requirements for corresponding construction inspection programs. These should apply to public-sector as well as private-sector construction programs.

R5 Research, strengthen (if necessary), implement, and enforce regulations which will give local jurisdictions the legal authority to require site drainage designs and systems which minimize the total volume of runoff and the peak rate of runoff from new construction, where local conditions permit.

R6 Research, strengthen (if necessary), and enforce regulations which give local jurisdictions the authority to require oil and grease controls in areas which are significant sources (e.g., gas stations, automotive shops, wrecking yards, machine shops, commercial/industrial facilities, parking areas, and food service establishments).

R7 Require new commercial, industrial, institutional, and major multi-family residential building complexes to have drainage facilities that incorporate on-site retention and/or infiltration -- to assure that neither the total volume of runoff nor the peak rate of runoff exceed pre-project conditions.

R8 Require new public and private sector developments to make significant use of permeable surfaces in new landscaping, recreation areas, walkways, and parking areas to maximize infiltration (e.g., bark, gravel, other ground cover, brick, cobblestones, porous pavement). Use planted areas and/orgrassy swales, where appropriate, to maximize retention and infiltration.

R9 Coordinate with the RWQCB to be sure that potential water quality impacts are adequately considered at the time NPDES permits are issued for any discharges to storm sewers or drainage channels. Include monitoring of all pertinent constituents as a permit stipulation.

R10 Develop and implement improved erosion and sediment control policies in the environmental elements of all General Plans (develop and adopt General Plan Amendments, where needed).

R11 Adopt policies which require all CEQA compliance documents and site drainage designs to explicitly address the following: erosion potential, proposed erosion and sediment control plans, proposed inspection programs, related environmental impacts, and enforceable mitigation measures to minimize environmental impacts.

R12 Develop and implement regulations which require landowners and/or tenants to provide covers (e.g., roofs, tarps) to keep rain off of areas which contain contaminants (e.g.,chemical storage areas, waste storage areas, contaminated industrial areas); and to keep runoff from draining through areas which contain contaminants.

R13 Coordinate with efforts (by others) to intensify the implementation of existing regulations which call for improved designs of new tanks (e.g., double walls, monitoring facilities); an aggressive self-monitoring program to be conducted by landowners and tenants; and a strategically focused spot-check program to search for, identify, test, and control leaking storage tanks.

"Public Agency" Control Measures

P1 Label storm drain inlets and provide signs along the banks of drainage channels and creeks explaining the environmental impacts of dumping wastes.

P2 Develop and implement programs which provide convenient means for people to properly dispose of oil, antifreeze, pesticides, herbicides, paints, solvents, and other potentially harmful chemicals (recycle if possible).

P3 Develop and implement an aggressive field program to search for, detect, and prevent dumping or routinely discharging pollutants into storm sewers and drainage channels. This may involve re-evaluating previous decisions which allowed certain relatively clean waters to be discharged to the stormwater systems.

P4 Develop and implement an agresive field program to search for, detect, and control illicit connections of sewers which carry sanitary and/or commercial/industrial wastewater.

P5 Determine the effectiveness of increasing the frequency of cleaning out storm sewer inlets, catchbasins, storm sewers, and drainage channels in areas where sediments and/or debris tend to accumulate. Develop and implement improved programs where appropriate.

P6 Develop and implement an aggresive field program to search for, test, remove, and properly dispose of sediment deposits (in drainage channels and streams) which contain relatively high concentrations of pollutants.

P7 Develop and implement a program which provides a means of recording the observations of field inspection and maintenance personnel, so this information can be used to help locate the source(s) of pollutants.

P8 Determine the effectiveness of retrofitting existing stormwater retention basins to function as detection basins (to trap sediments from small storm events).

P9 Determine the effectiveness of building, maintaining, and testing relatively large detention basins at several locations in the lower reaches of the watershed.

P10 Determine the effectiveness of establishing, maintaining, and testing wetlands and riparian vegetation in retrofitted and/or new drainage channels.

P11 Determine the effectiveness of building, establishing, and maintaining relatively large man-made wetland basins at several location in the lower reaches of the watershed.

P12 Develop and implement an aggressive field program to search for, detect, and correct situations where rainfall and/or runoff presently contact potential contaminants.

P13 Determine the effectiveness of retrofitting selected Sunnyvale storm sewers, sanitary sewers, and portions of the Sunnyvale POTW to allow the plant to receive and treat runoff from small storms and strategic portions of large storms.

P14 Develop and implement intensifed street sweeping programs in strategic locations (e.g., central business districts, shopping malls, major parking lots, industrial areas) and/or at strategic times (e.g., following extended periods of dry weather).

P15 Determine the effectiveness of retrofitting existing infiltration basins to accept and treat storm runoff.

P16 Develop and implement bimonthly clean up days and corresponding curbside collection for trash and debris.

P17 Provide, collect, and maintain more litter recepticles in strategic public areas and during major public events.

P18 Provide generic plans, specifications, and demonstrate project results which will encourage architects, engineers, and building departments to implement systems which temporarily retain rainfall peaks on rooftops and/or in retention facilities to minimize the peak rate of discharge to the storm sewer systems or drainage channels.

P19 Build, maintain, and assess the performance of several relatively small detention basins at selected locations in urbanized areas throughout the watershed. Begin by reviewing the operational histories of existing detention basins (e.g., Morgan Hill).

P20 Build, establish, maintain, and assess the performance of several relatively small man made wetlands basins at selected locations in urbanized areas throughout the watershed.

P21 Develop and implement an aggressive field program to search for, detect, and control sanitary sewer leaks and areas where surcharging and/or overflows are most likely to occur.

P22 Develop and implement programs to actively search for, identify, evalute, and prioritize erosion problems on undeveloped land, park land, and agricultural land.

P23 Develop and implement programs to work with landowners, tenants, and/or public agencies to apply practical erosion control and sediment control practices.

P24 Develop and implement practical progams for revegetating and otherwise restoring actively eroding areas (e.g., areas damaged by fires, overgrazing, landslides, improper tillage, and off road vehicle use).

P25 Coordinate with the Soil Conservation Service and local resource conservation programs to support their activities to control erosion and sedimentation problems.

P26 Cooperate with public transportation agencies, public agency motorpools, and public works departments to provide effective air pollution controls on publically owned vehicles and motorized equipment -- and/or to use alternative clean-burning fuel where practical.

P27 Determine the effectiveness of using street flushers to reduce pollutants in runoff.

P28 Determine the effectiveness of developing in-line infiltration facilities within selected reaches of large capacity drainage channels to accept and treat storm runoff.

P29 Build, maintain, and assess the performance and potential impacts of several relatively small infiltration basins at selected locations in urbanized areas throughout the watershed.